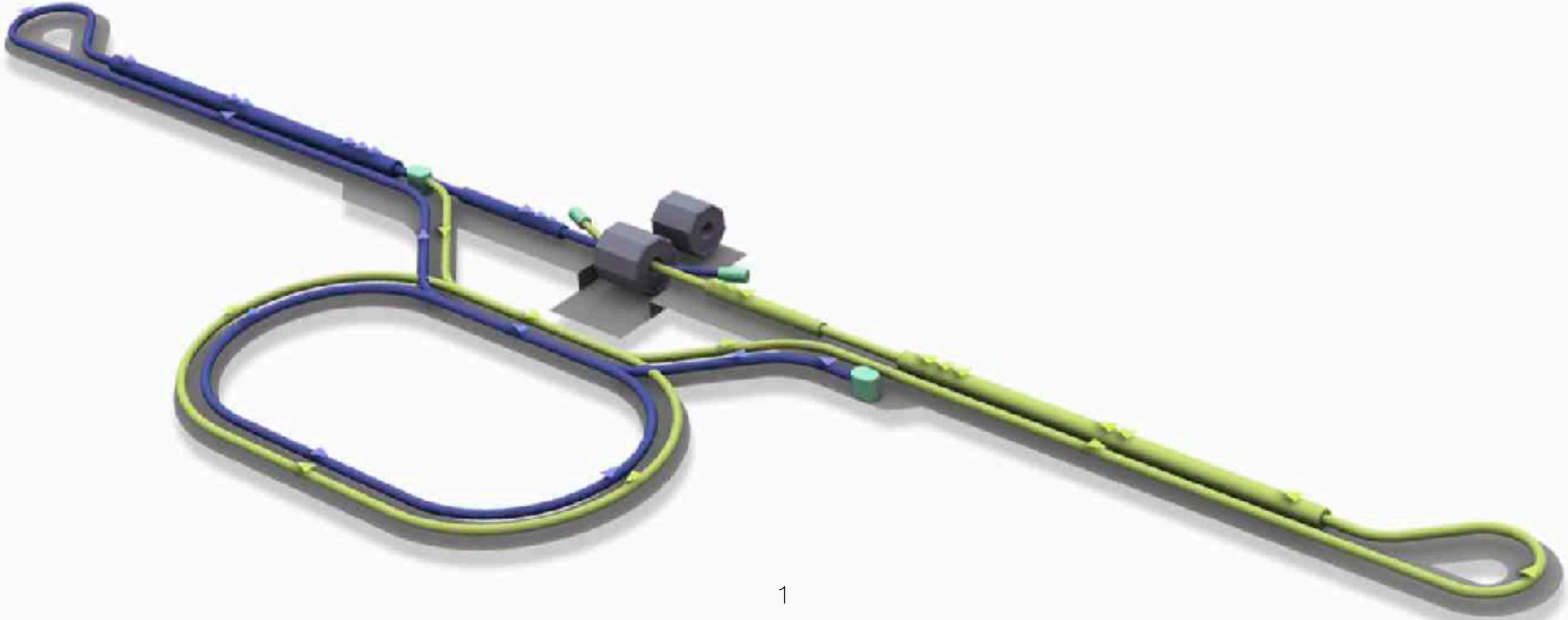
ILC IDT WG3
Physics & Detector

Hitoshi Murayama (Berkeley/Kavli IPMU)
BCLC 2021, Jul 22, 2021



ILC

- We’ve known since 60’s that we should go linear
  - mature design since Technical Design Report in 2013
- Lots of technical progress since then
  - SCRF gradient, yield
  - low emittance
- European Strategy: Higgs factory = highest priority
  - the only “affordable” (~LHC) machine ready to go
- linear: extendable to higher energies
  - need to finalize engineering design
- strong political support among Japanese politicians
- “Pre-lab” four-year process incl. international negotiations
  - proposal submitted to MEXT, under review

Shin Michizono

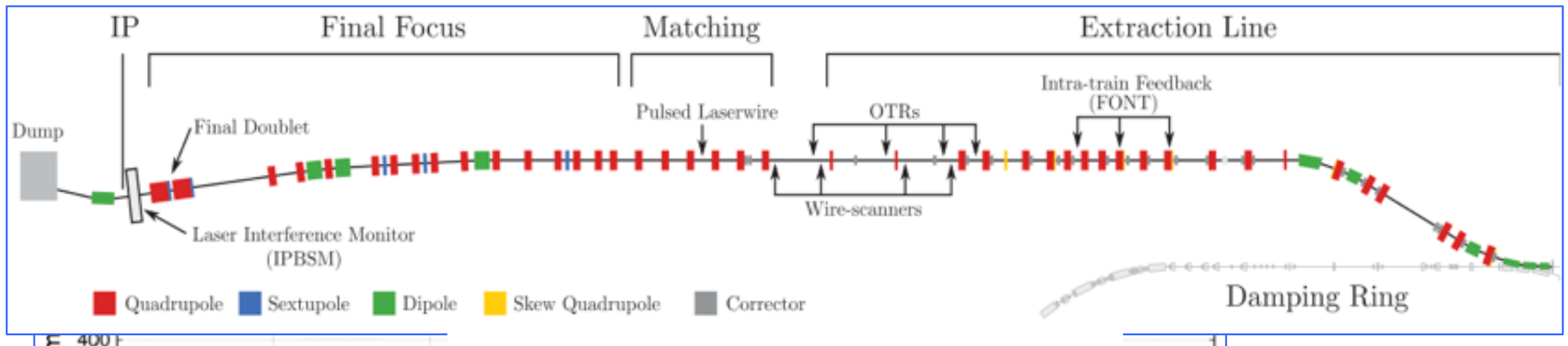
Nano-beam R&D at ATF2

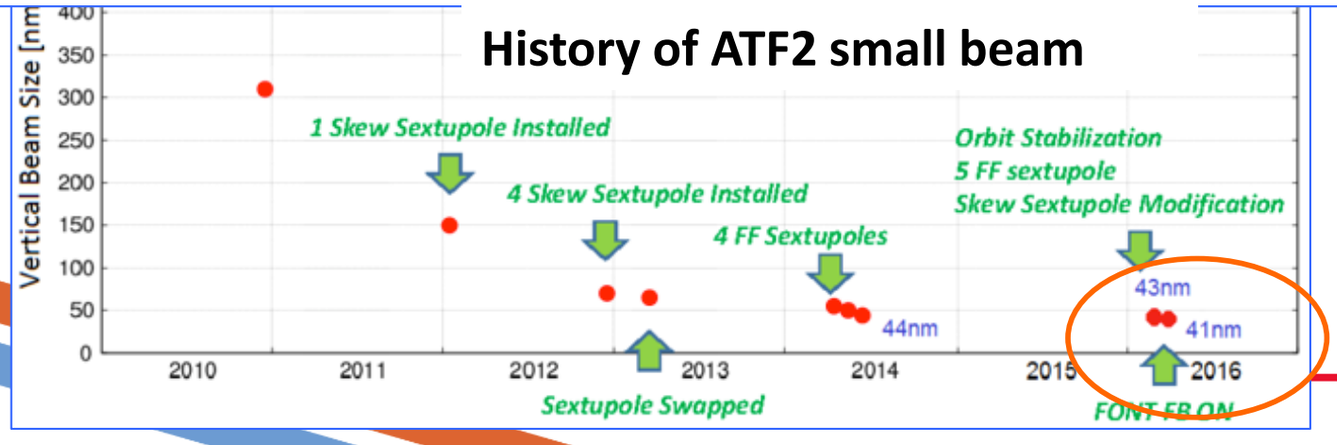
Goal 1: Establish the ILC final focus method with same optics and comparable beamline tolerances

ATF2 Goal : **37** nm → ILC **7.7** nm (ILC250); achieved **41 nm** (2016)

Goal 2: Develop the position stabilization for the ILC collision

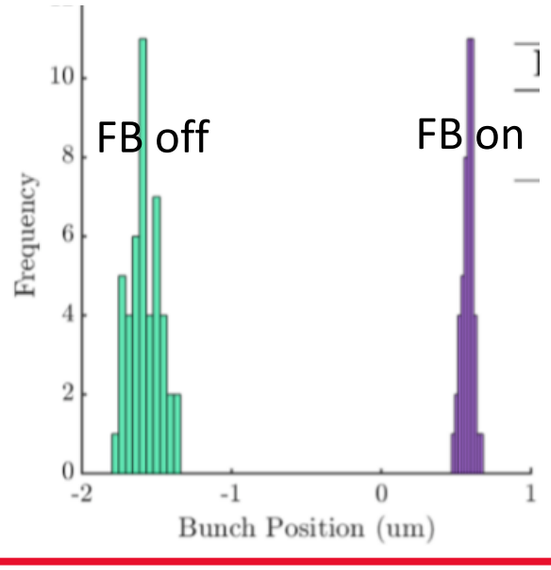
- **FB latency 133 nsec achieved** (target: < 366 nsec)
- **positon jitter at IP: 106 → 41 nm (2018)** (limited by the BPM resolution)





Nano-meter stabilization at IP

(2018)

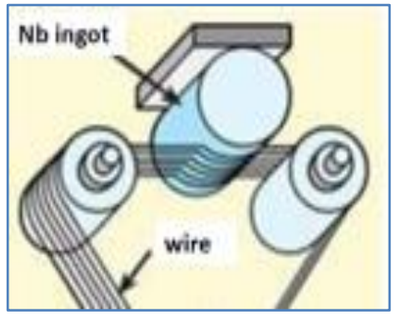


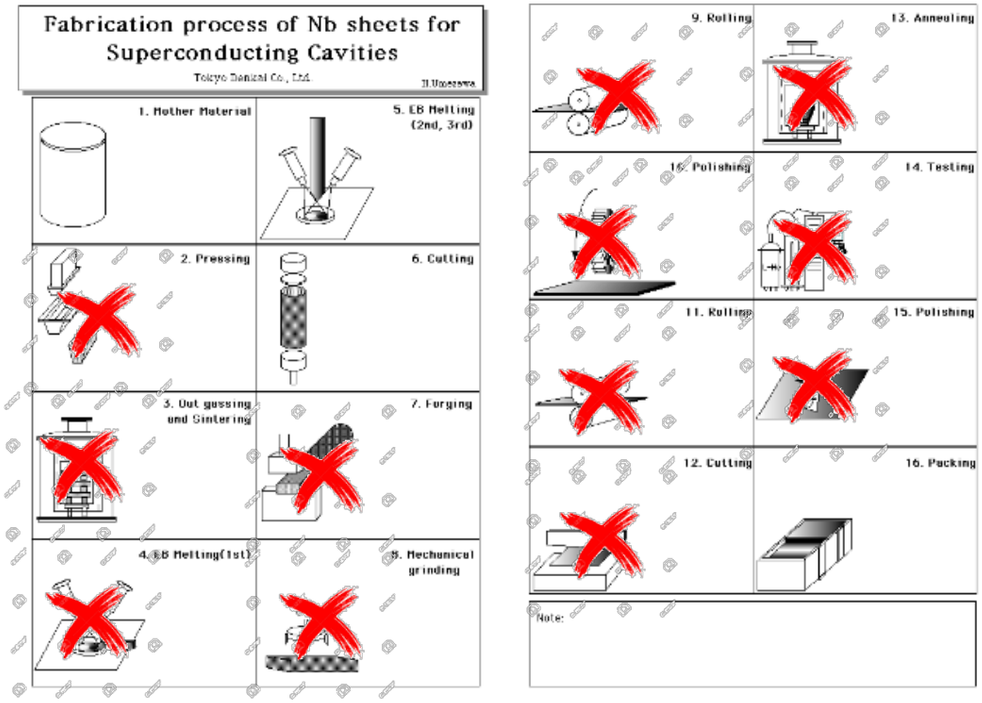
Shin Michizono

ILC Cost-Reduction R&D in US-Japan Cooperation

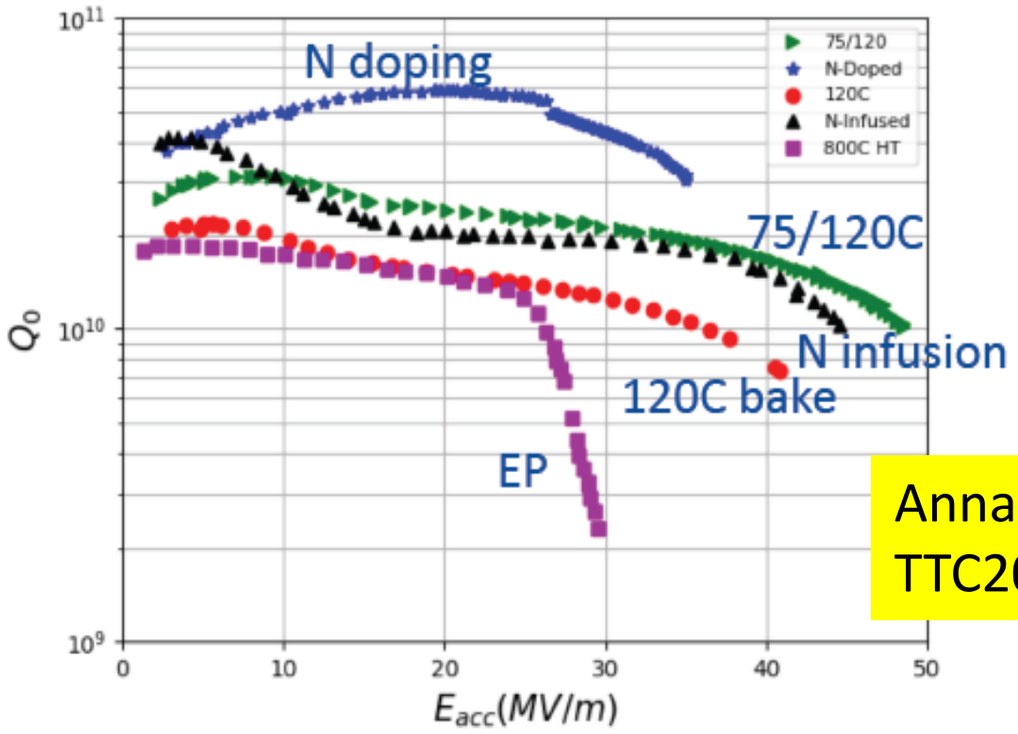
Based on recent advances in technologies;

- Nb material/sheet preparation
  - w/ optimum Nb purity and clean surface

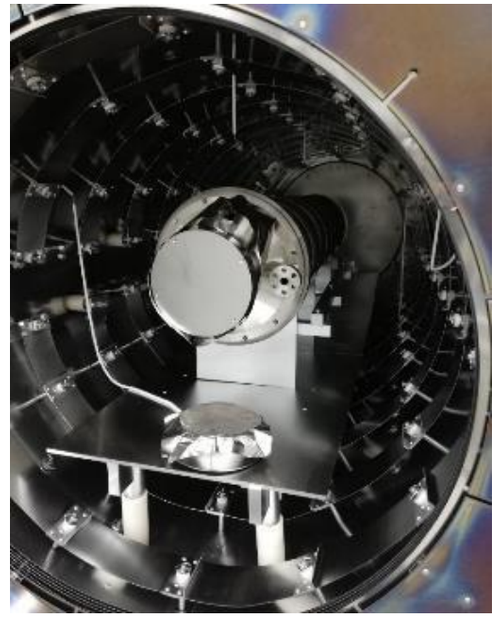




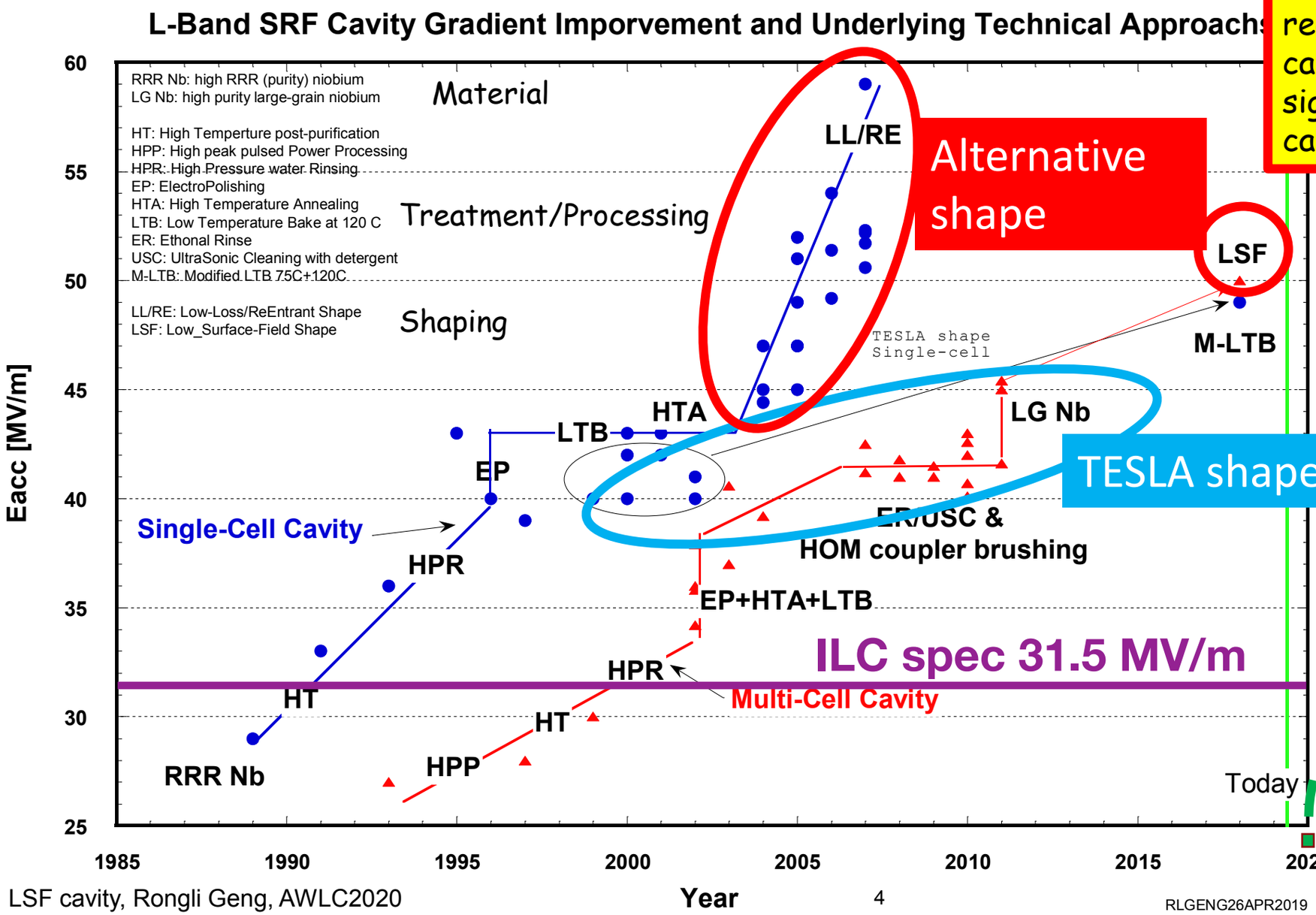
- Surface treatments for high-Q and high-G



Anna Grassellino
TTC2019 Vancouver



Technical Approaches to Gradient



Cavity shaping led to gradient breakthrough with Nb cavities reaching 45 - 59 MV/m in 1-cell cavities ten yrs ago & emerging sight of 50 MV/m in multi-cell cavities in last two years

~50 MV/m observed in TESLA shape 1-cell Nb cavities with modified LTB 75°C+120°C

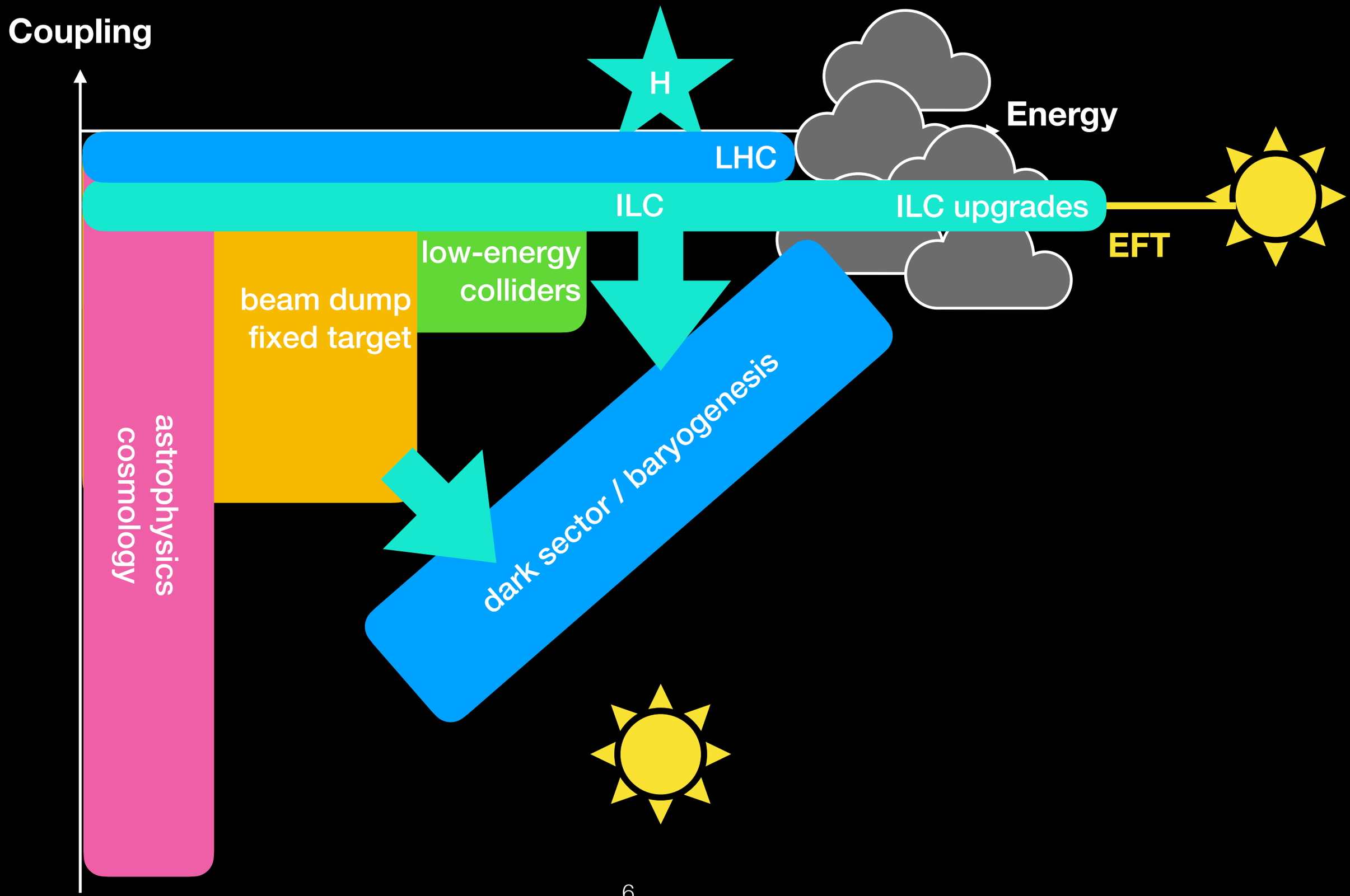
24 MV/m observed in today's best Nb3Sn 1-cell cavity - aiming 80 MV/m as ultimate goal

LSF cavity, Rongli Geng, AWLC2020

RLGENG26APR2019

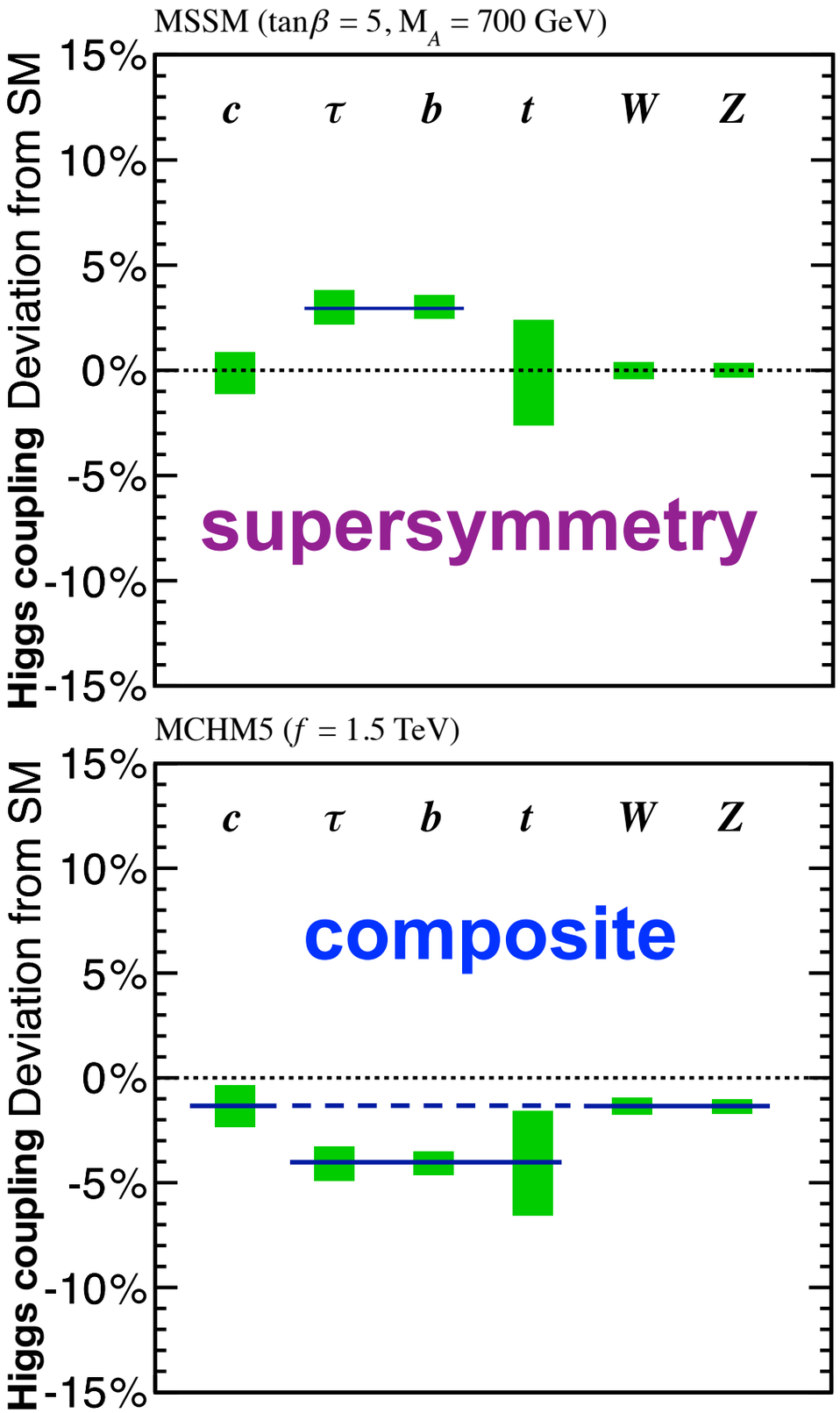
Jefferson Lab

ILC++


Coupling
Energy
H
LHC
ILC
ILC upgrades
EFT
low-energy colliders
beam dump fixed target
astrophysics cosmology
dark sector / baryogenesis

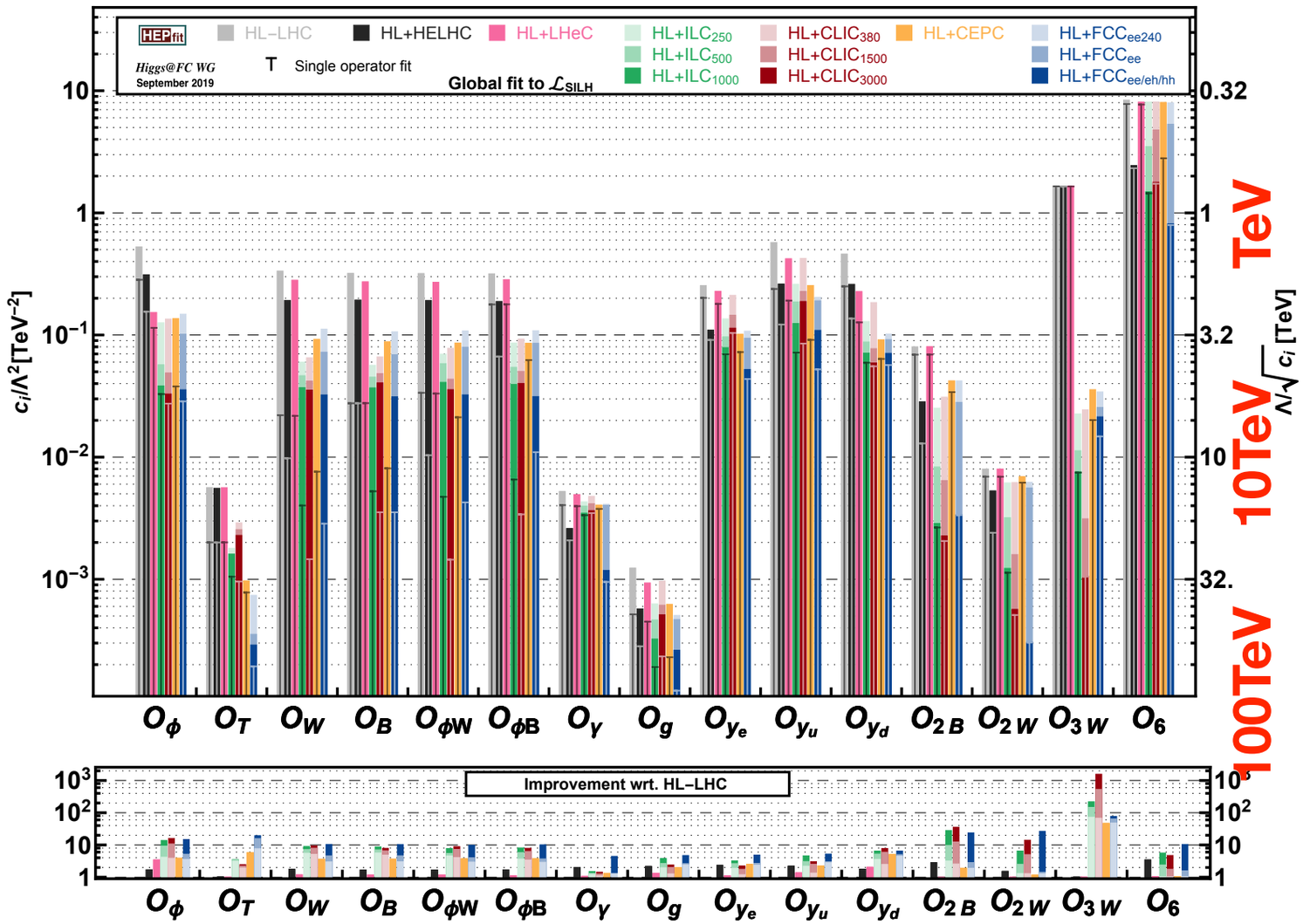
What is Higgs boson really?

Tomohiko Tanabe
Adrián Irles



What is the next energy scale?

x10 HL-LHC

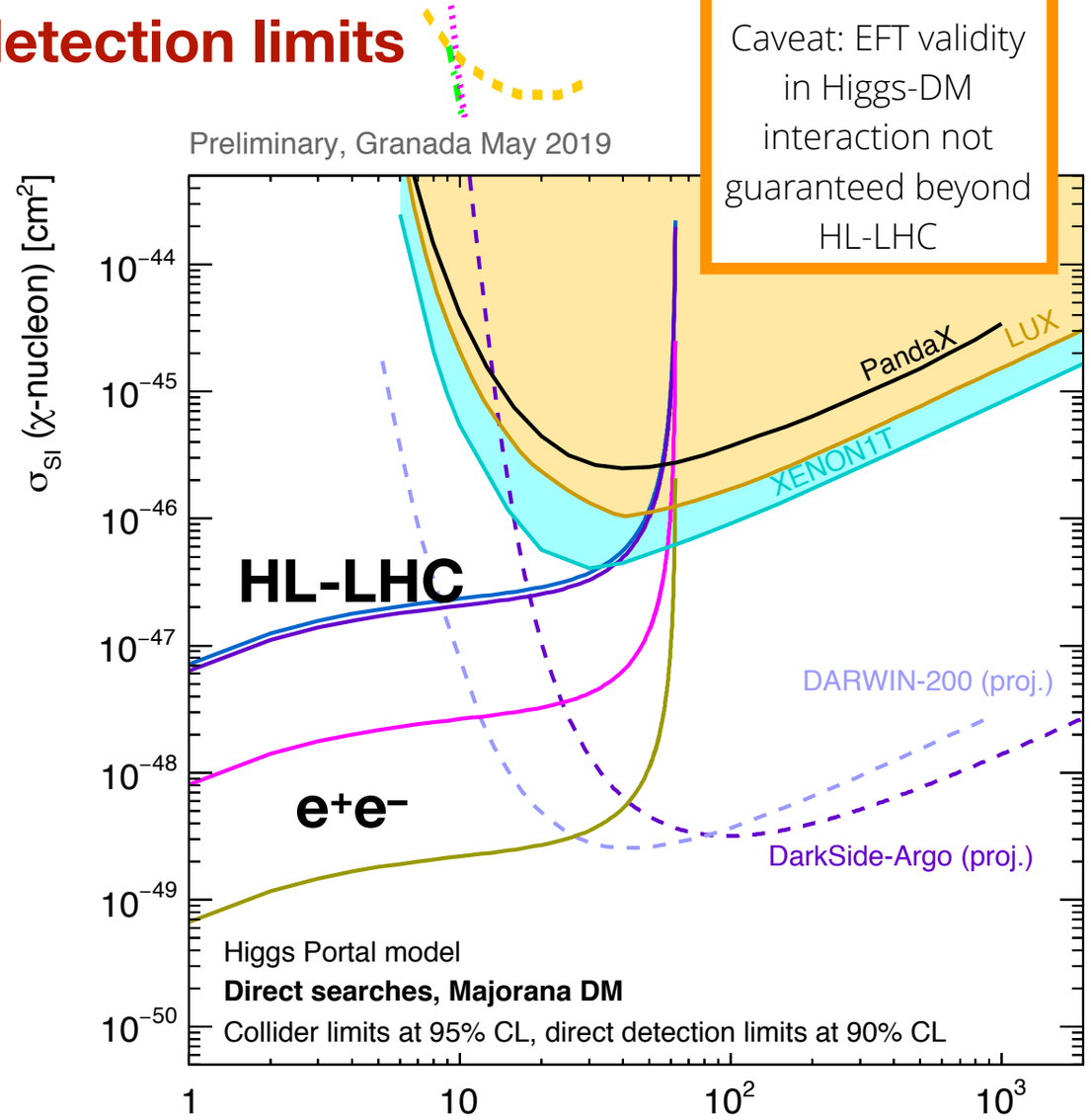


2000fb^{-1}@250GeV
200fb^{-1}@350GeV
4000fb^{-1}@500GeV

Higgs decay to dark matter

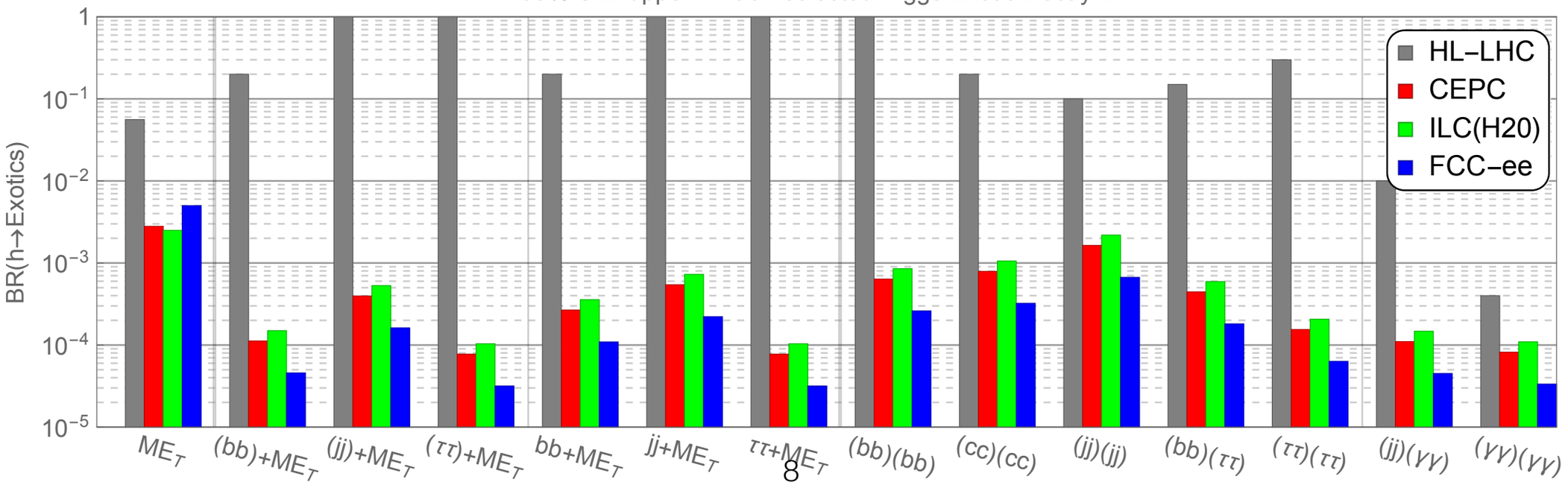
x10 HL-LHC

direct detection limits



x1000–10000 HL-LHC

Higgs → dark sector → SM exotic Higgs decays

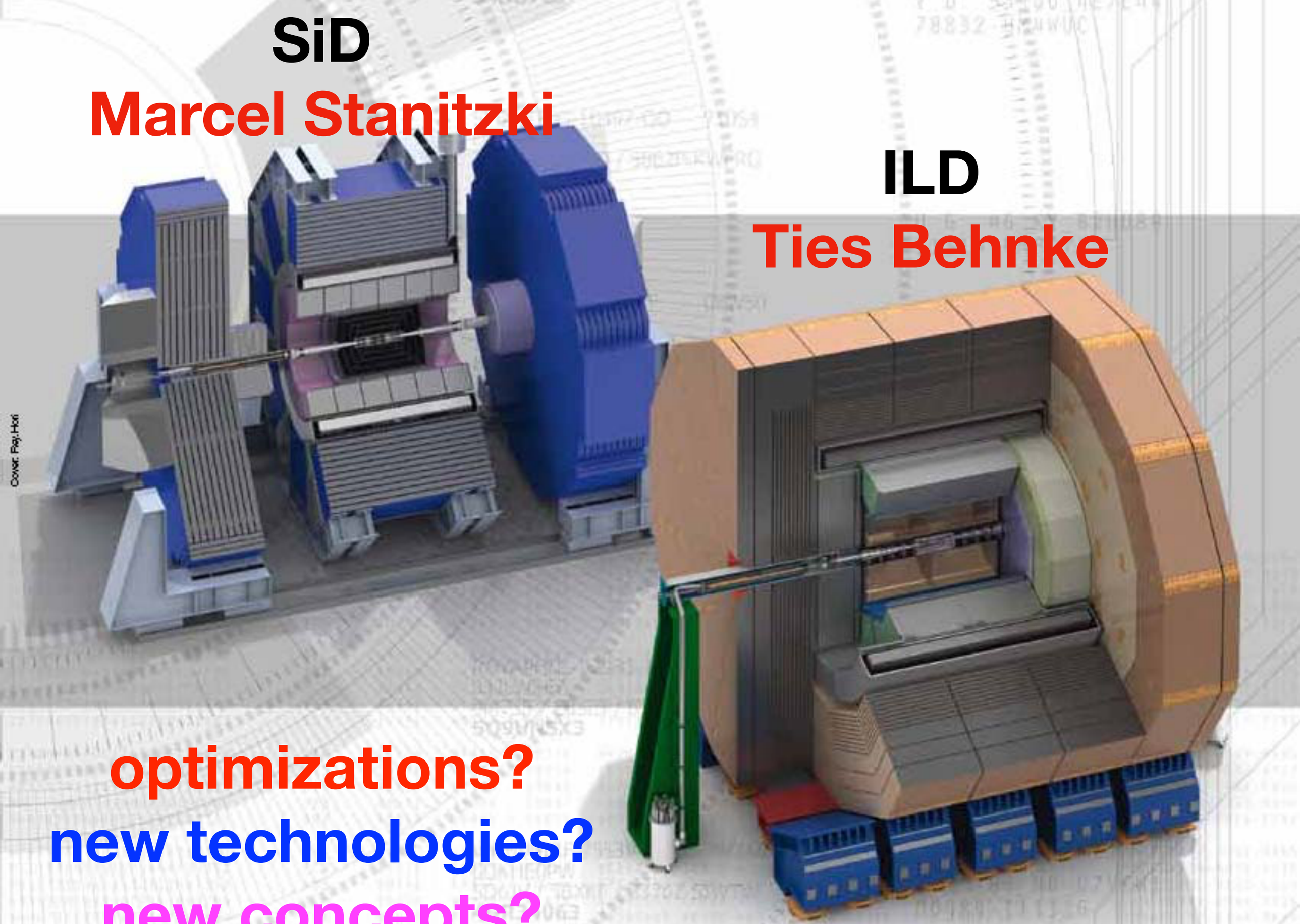


SiD

Marcel Stanitzki

ILD

Ties Behnke

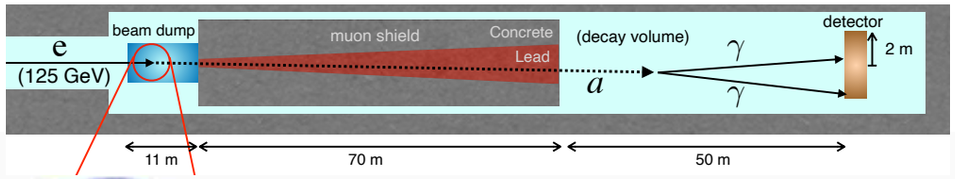


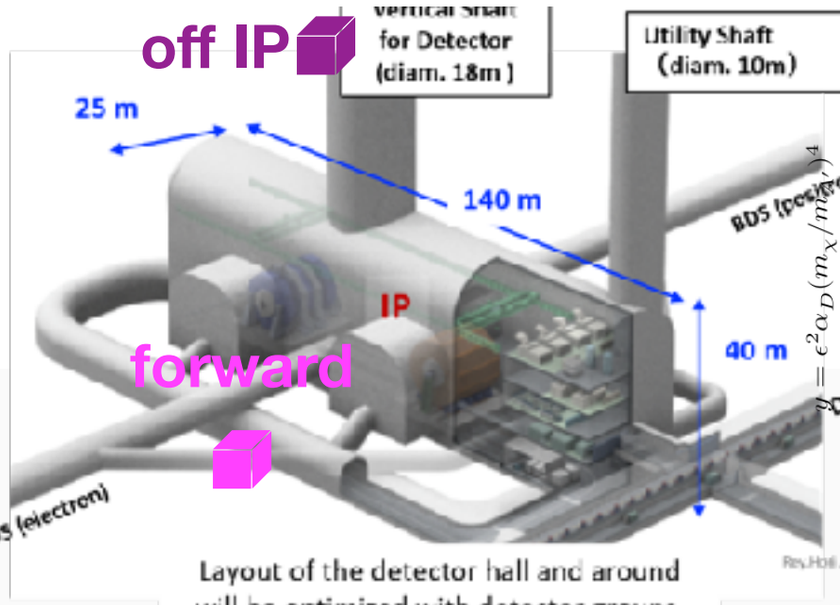
Cover: Ray Hori

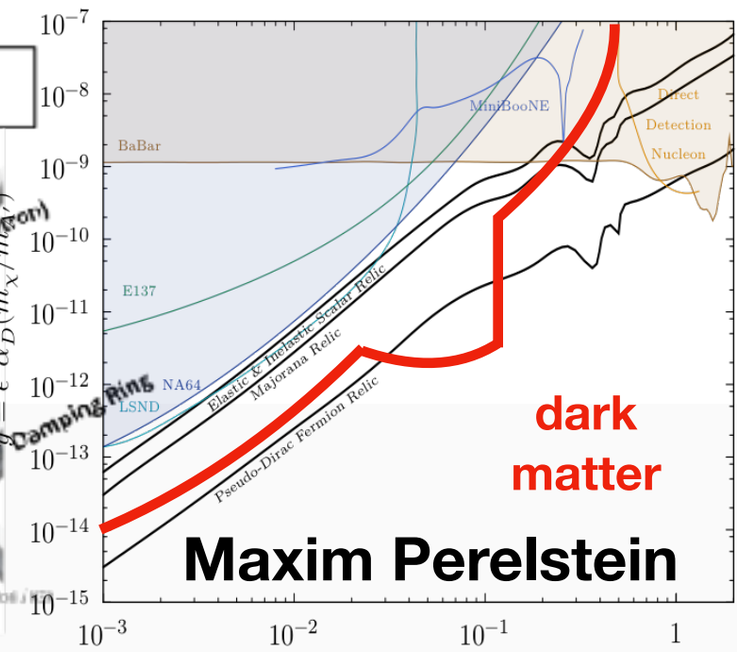
optimizations?

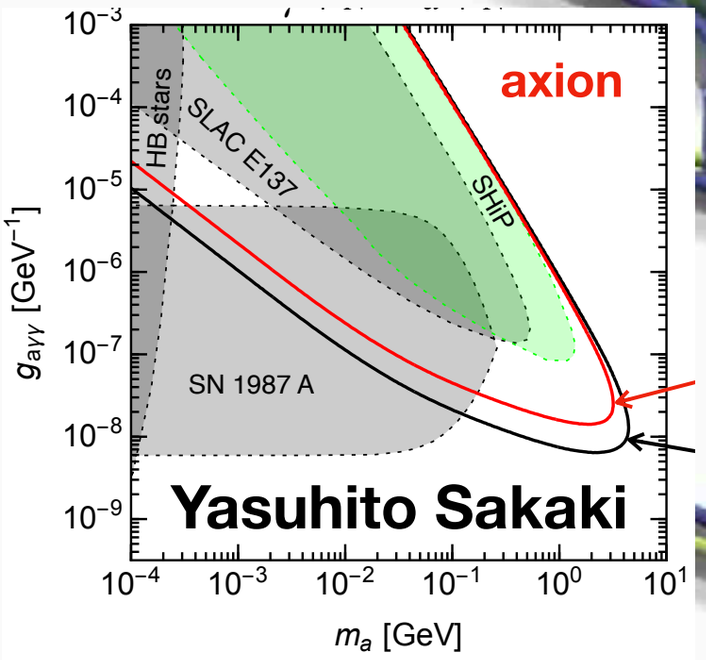
new technologies?

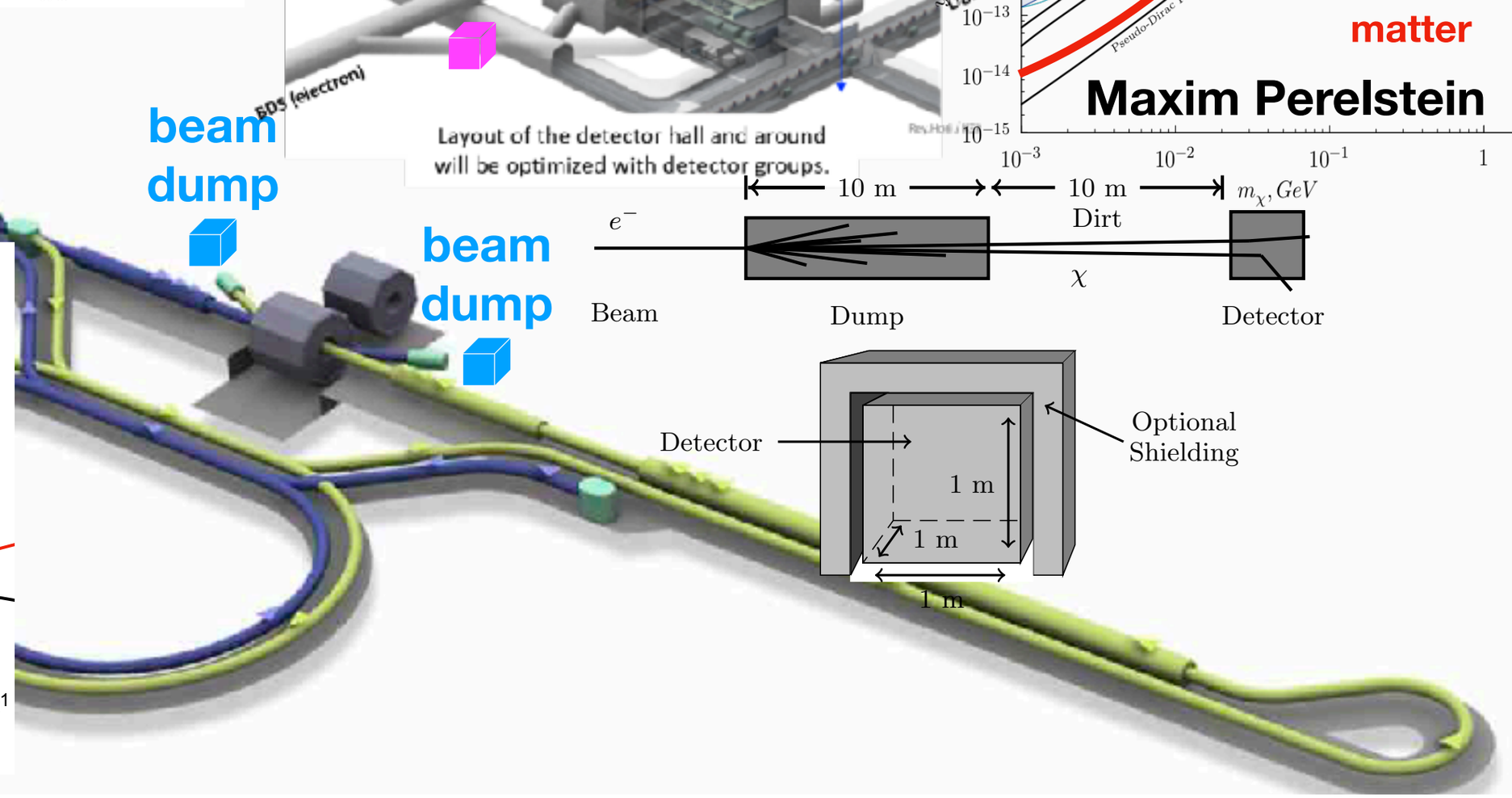
new concepts?


e
(125 GeV)
beam dump
muon shield
Concrete
Lead
(decay volume)
detector
2 m
11 m
70 m
50 m

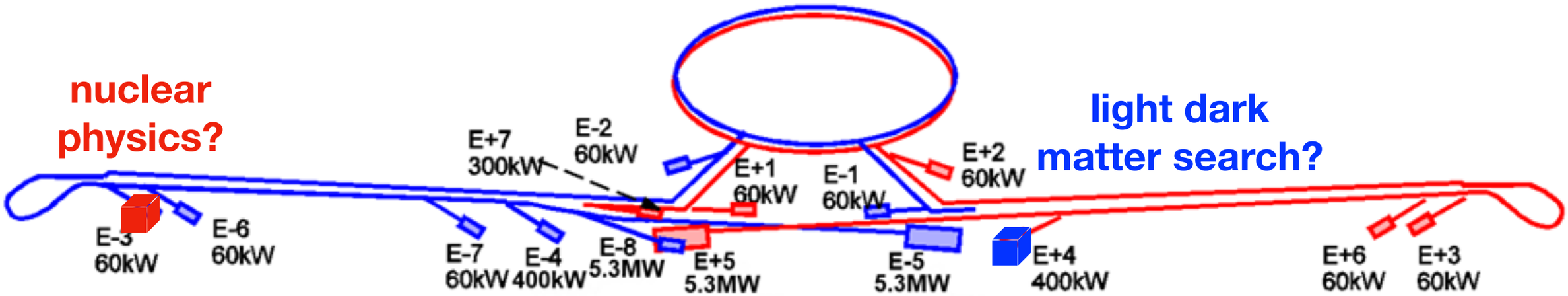

off IP
Vertical Shaft for Detector (diam. 18m)
Utility Shaft (diam. 10m)
25 m
140 m
40 m
IP
forward
BDS (positron)
BDS (electron)
Damping Ring
Layout of the detector hall and around will be optimized with detector groups.


BaBar
MiniBooNE
Direct Detection
Nucleon
E137
NA64
LSND
Elastic & Inelastic Scalar Relic
Majorana Relic
Pseudo-Dirac Fermion Relic
dark matter
Maxim Perelstein
$y = \epsilon^2 \alpha_D (m_\chi / m_{electron})^4$
m_χ, GeV


axion
HB stars
SLAC E137
SHIP
SN 1987 A
Yasuhito Sakaki
$g_{a\gamma\gamma}$ [GeV^{-1}]
m_a [GeV]


beam dump
beam dump

10 m
10 m
Dirt
m_χ, GeV
e^-
χ
Beam
Dump
Detector
Detector
Optional Shielding
1 m
1 m
1 m


nuclear physics?
light dark matter search?
E-3 60kW
E-6 60kW
E+7 300kW
E-2 60kW
E-7 60kW
E-4 400kW
E-8 5.3MW
E+5 5.3MW
E+1 60kW
E-1 60kW
E-5 5.3MW
E+2 60kW
E+4 400kW
E+6 60kW
E+3 60kW

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_3Sn	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.

ICFA: International Committee for Future Accelerators
LCB: Linear Collider Board
LCC: Linear Collider Collaboration
IDT: International Development Team

WG3 Organisation and mandates

Chair: Hitoshi Murayama (Berkeley/Tokyo)

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

Coordinator and Deputy coordinator(s)

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

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)

Speaker's bureau

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

Interface with machine

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

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

Detector and technology R&D

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

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

Software and computing

Promote and provide coordination of the software development and computing planning

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

Physics potential and opportunity

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

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

Open to anybody interested!

https://linearcollider.org/team/

approved by IDT EB Feb 4, 2021

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

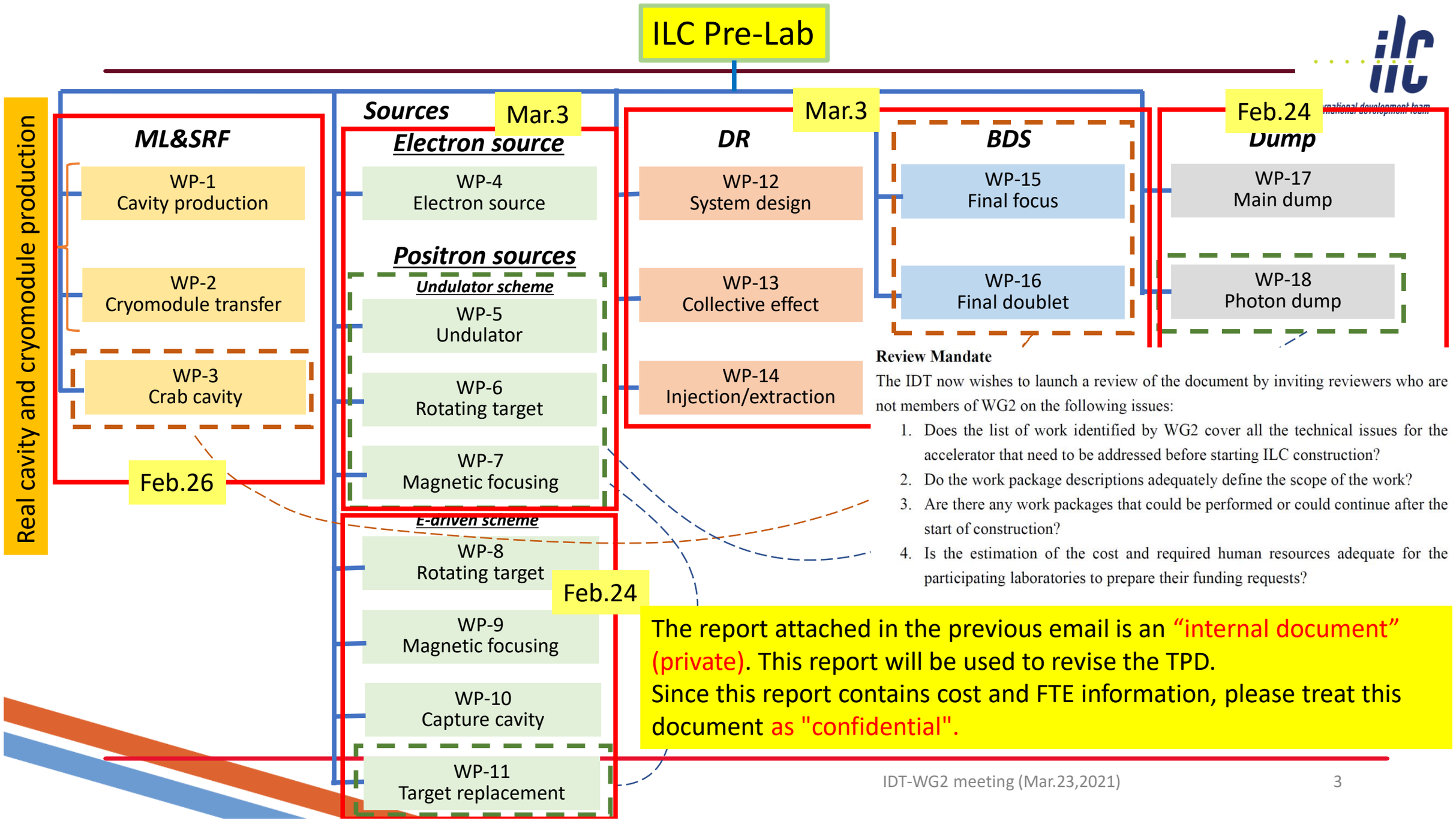
ILC is moving towards the preparatory laboratory stage (Prelab), currently envisioned to start in 2022. In order to activate the community towards preparing the Expressions of Interest for the experiments, the Physics and Detector Working Group (WG3) aims to:

- 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/



Review Mandate

The IDT now wishes to launch a review of the document by inviting reviewers who are not members of WG2 on the following issues:

1. Does the list of work identified by WG2 cover all the technical issues for the accelerator that need to be addressed before starting ILC construction?
2. Do the work package descriptions adequately define the scope of the work?
3. Are there any work packages that could be performed or could continue after the start of construction?
4. Is the estimation of the cost and required human resources adequate for the participating laboratories to prepare their funding requests?

The report attached in the previous email is an “internal document” (private). This report will be used to revise the TPD.
Since this report contains cost and FTE information, please treat this document as "confidential".

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.

MDI WG

Enter your search term

Create

July 2021

- 23 Jul MDI-Physics Meeting - Kickoff II NEW
- 15 Jul MDI-CFS Meeting (protected)
- 05 Jul MDI-Physics Meeting - Kickoff I

June 2021

- 24 Jun MDI-CFS Meeting (protected)
- 21 Jun MDI WG3 Pre Kickoff
- 10 Jun MDI-CFS Meeting (protected)

Managers

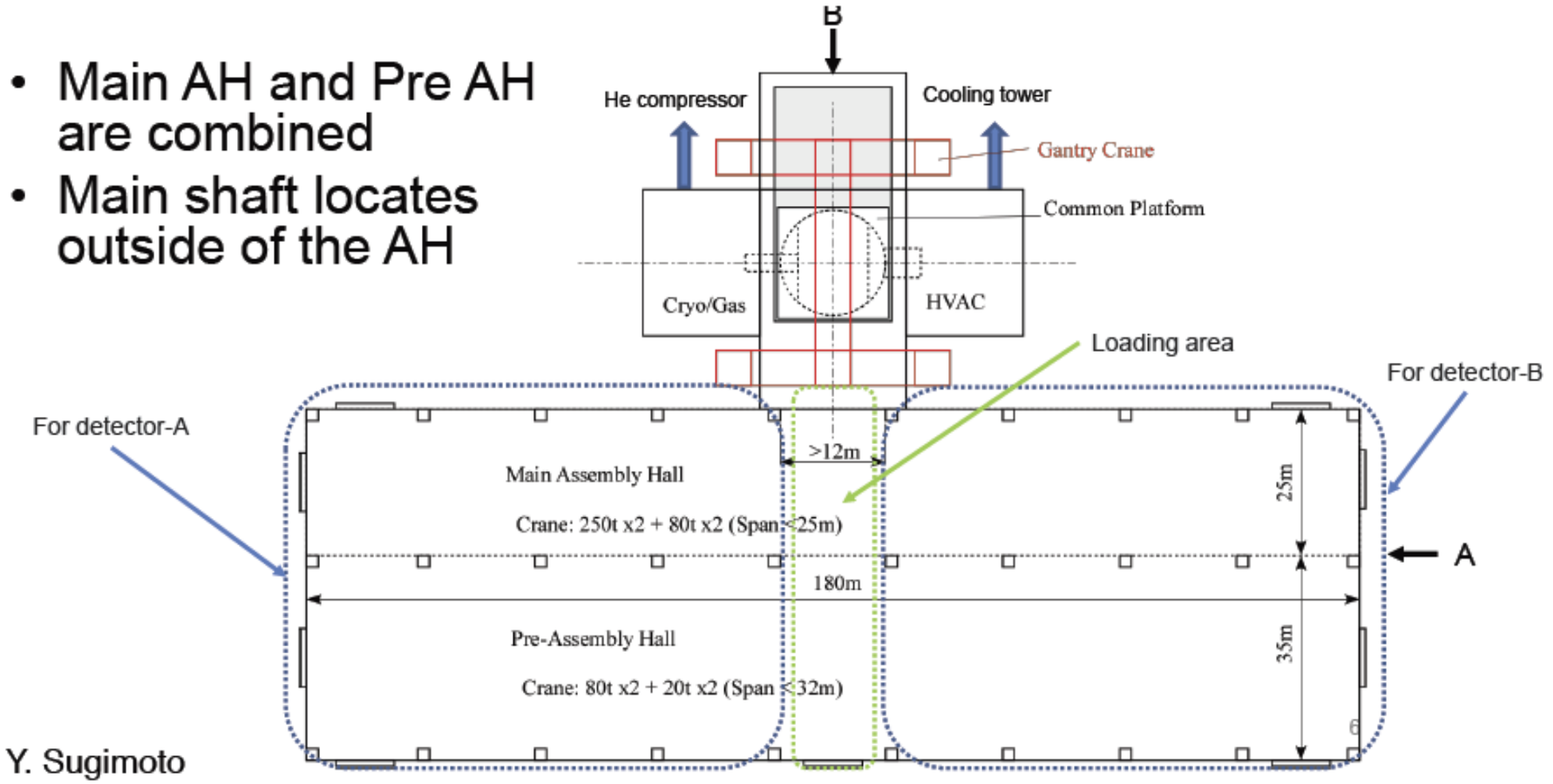
- Karsten Buesser
- Roman Poeschl
- Thomas Markiewicz
- Yasuhiro Sugimoto

Materials

There are no materials yet.

New Assembly Hall Proposal

- Main AH and Pre AH are combined
- Main shaft locates outside of the AH



Y. Sugimoto

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.

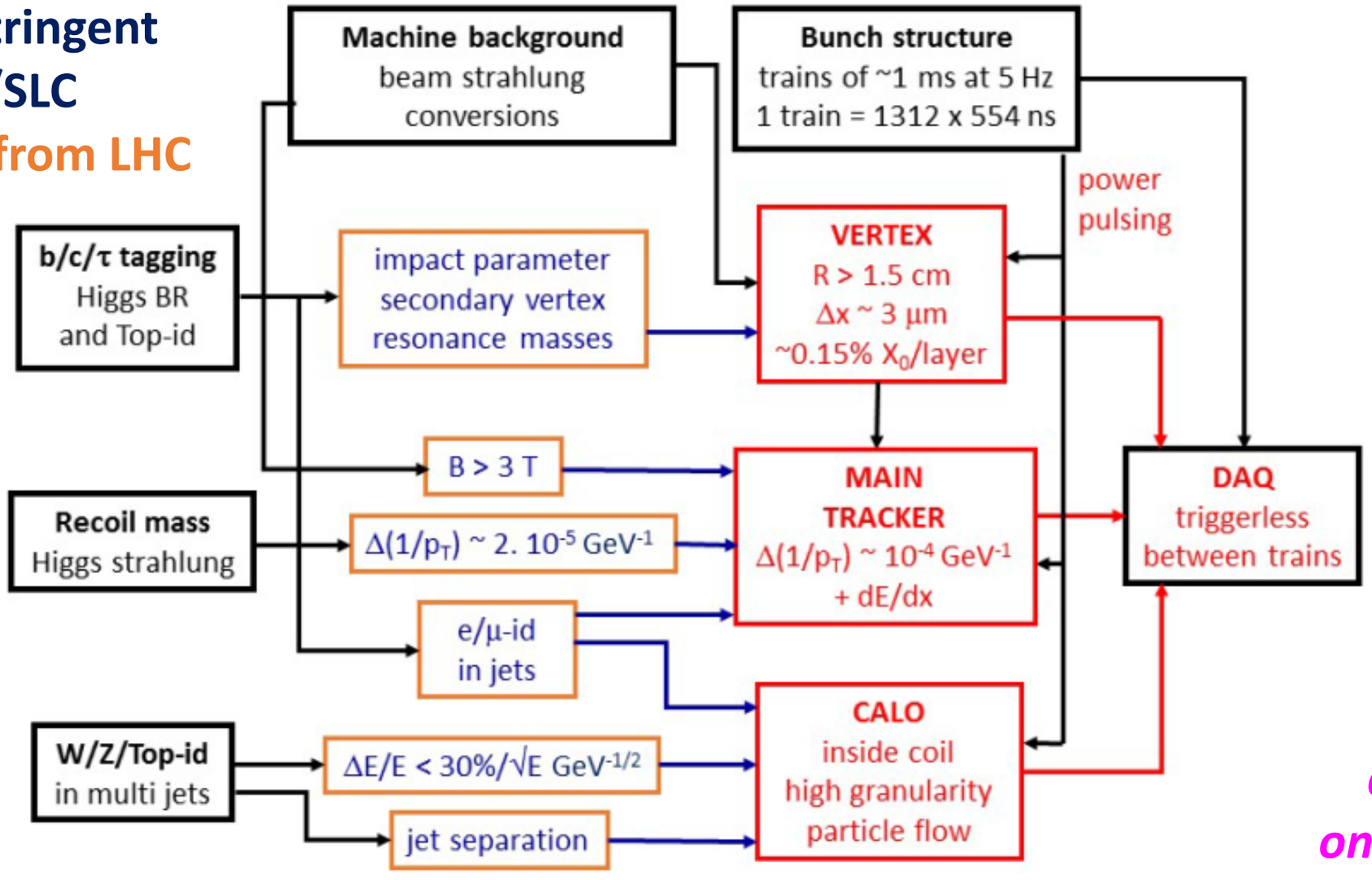
- Detector performance studies: Monte-Carlo simulation studies to assess the benefit of new detector technologies and to compare the performance of alternative solutions. This panel has strong links to the software and physics working groups.

Rather consensual

Much more stringent than LEP/SLC

Very different from LHC

ILC DETECTORS SPECIFICATIONS



→ steady ILC-oriented detector R&D ongoing for more than 15 years

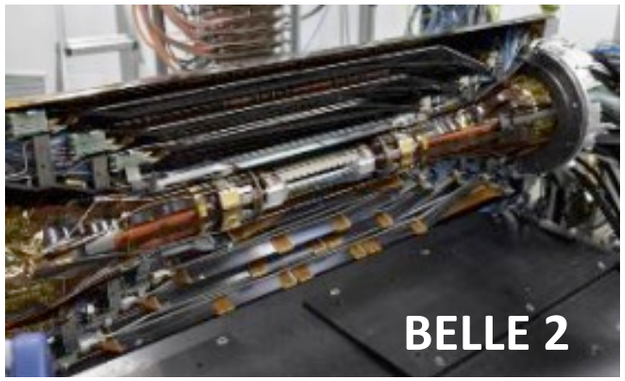
Open point: ***Physics potential of high EM energy resolution for single photon measurement***

SILICON DETECTORS (VERTEX & MAIN TRACKER)

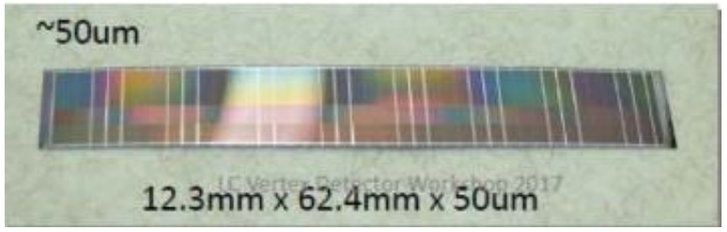
3 baseline pixel technologies considered for Vertex detector:

CMOS

DEPFET



FPCCD



Current developments (mainly CMOS) driven by HL-LHC, BELLE 2 upgrades and CMB@FAIR

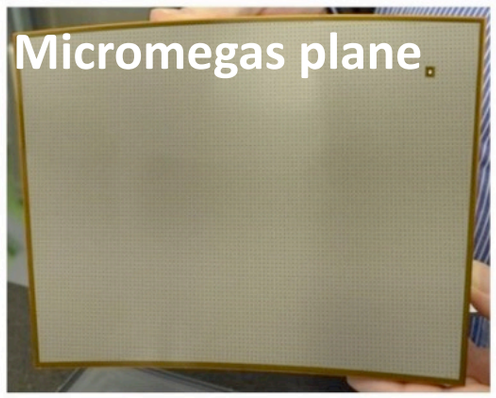
Pixel detectors are also challenging standard strips for main tracker

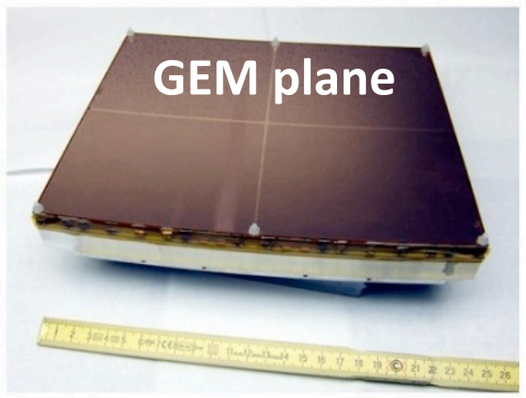
Potential new features compared to current baseline:
High-resolution timing (e.g. LGAD sensors) for e.g. TOF measurement

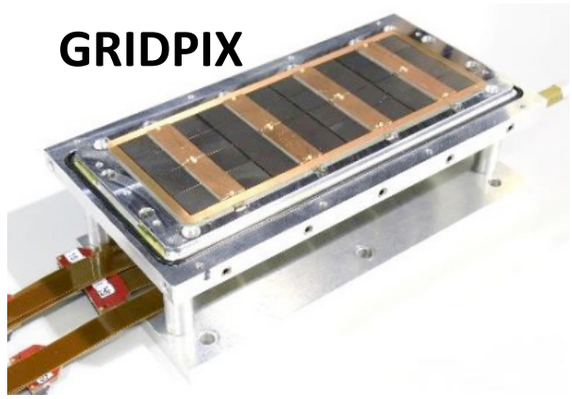
Best compromise to be found between
performance (Δx, Δt) and power consumption (cooling material)

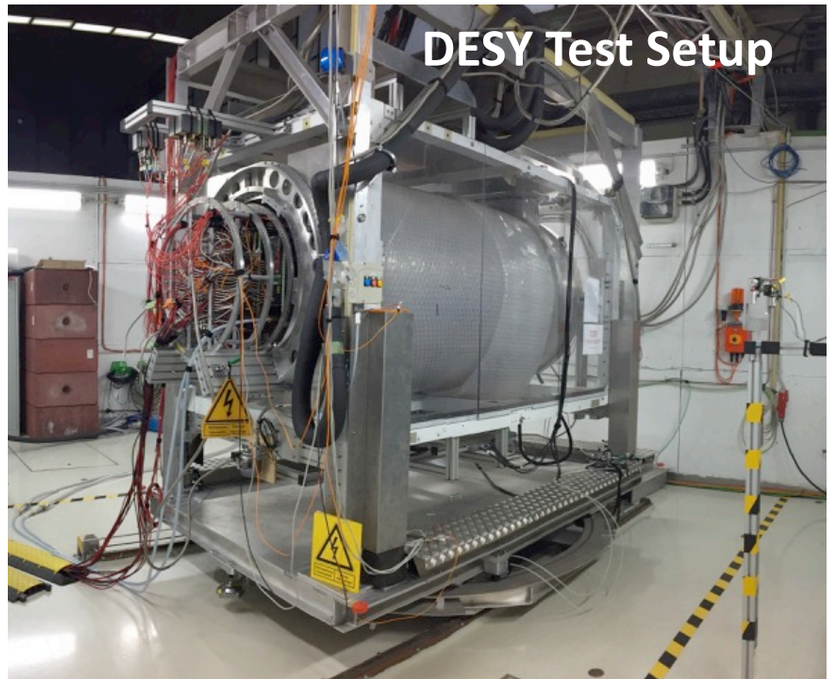
GASEOUS DETECTORS

TPC option for main tracker developed by LC-TPC
Collaboration using permanent beam test setup at DESY
3 RO options under development: Micromegas/GEM/pixel









Required 100 µm spatial and 5% dE/dx resolutions achieved
Ion gating scheme with GEMs under final design

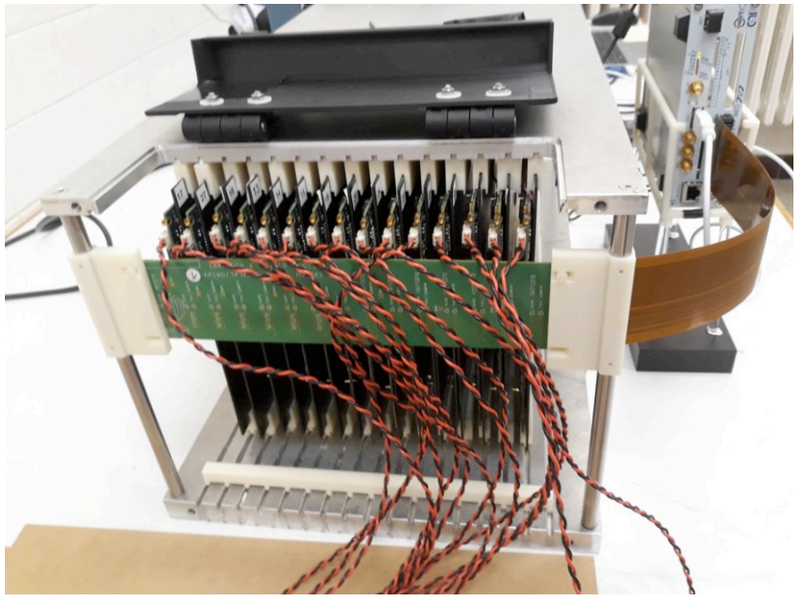
TPC developments also benefit from synergies with ALICE and T2K Near Detector upgrades

ELECTROMAGNETIC CALORIMETRY

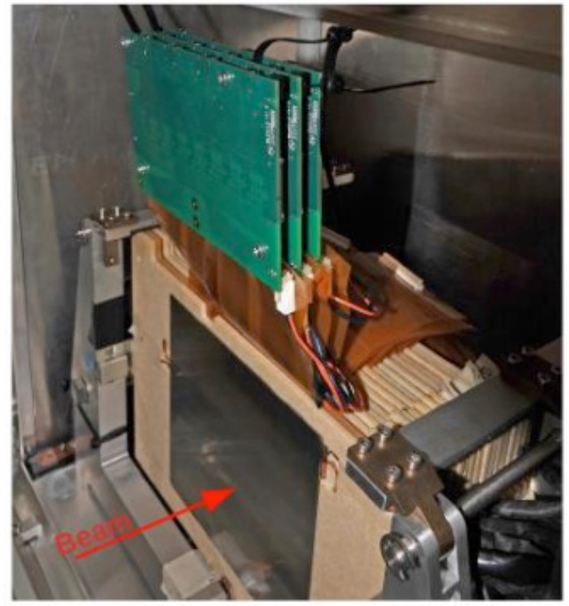
Si-W baseline option of main EM calo developed by CALICE Collaboration

(Scintillator option also considered to reduce costs)

15-layers CALICE Si-W technological prototype



Special issues for Lumical & Beamcal (radiation, compactness) addressed by FCAL Collaboration



Strong boost of Si-W technology thanks to CMS HGCAL upgrade

<u>Possible new options under consideration</u>:

High-resolution timing layers for TOF measurements and PFA improvement

Digital pixel readout of Si sensors (DECAL)

Crystal ECAL for high EM resolution (together with Dual Readout HCAL)

MUON DETECTORS

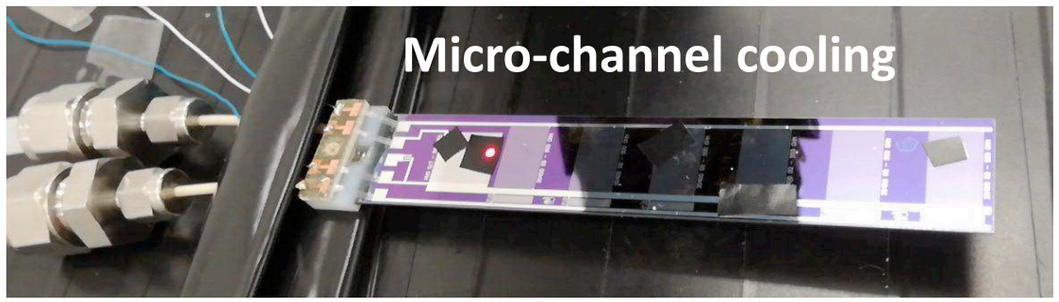
Current baseline option:
Scintillator bars with SiPM readout

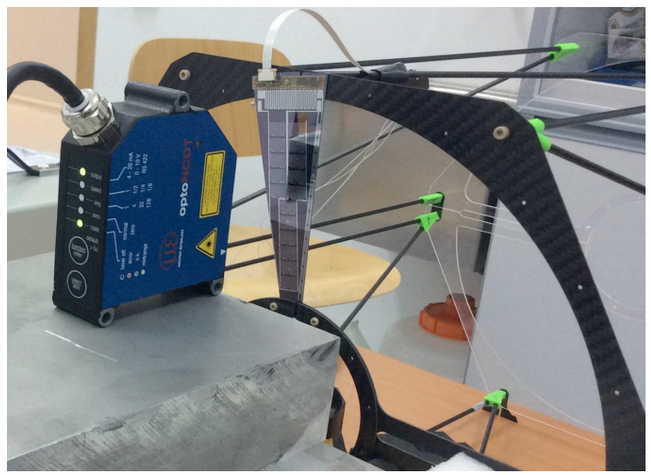
Also considered: RPC planes with optional

- **multigap high-resolution timing (TOF)**
- **low-cost "virtual strip" RO layout**

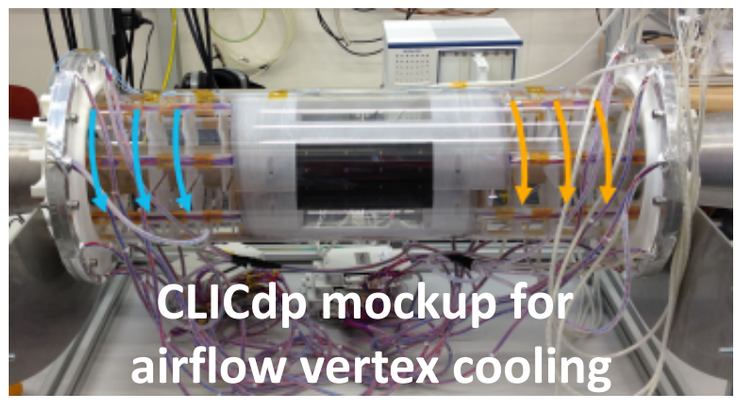
SOME ENGINEERING ISSUES: low material trackers

Used for BELLE-II beam commissioning





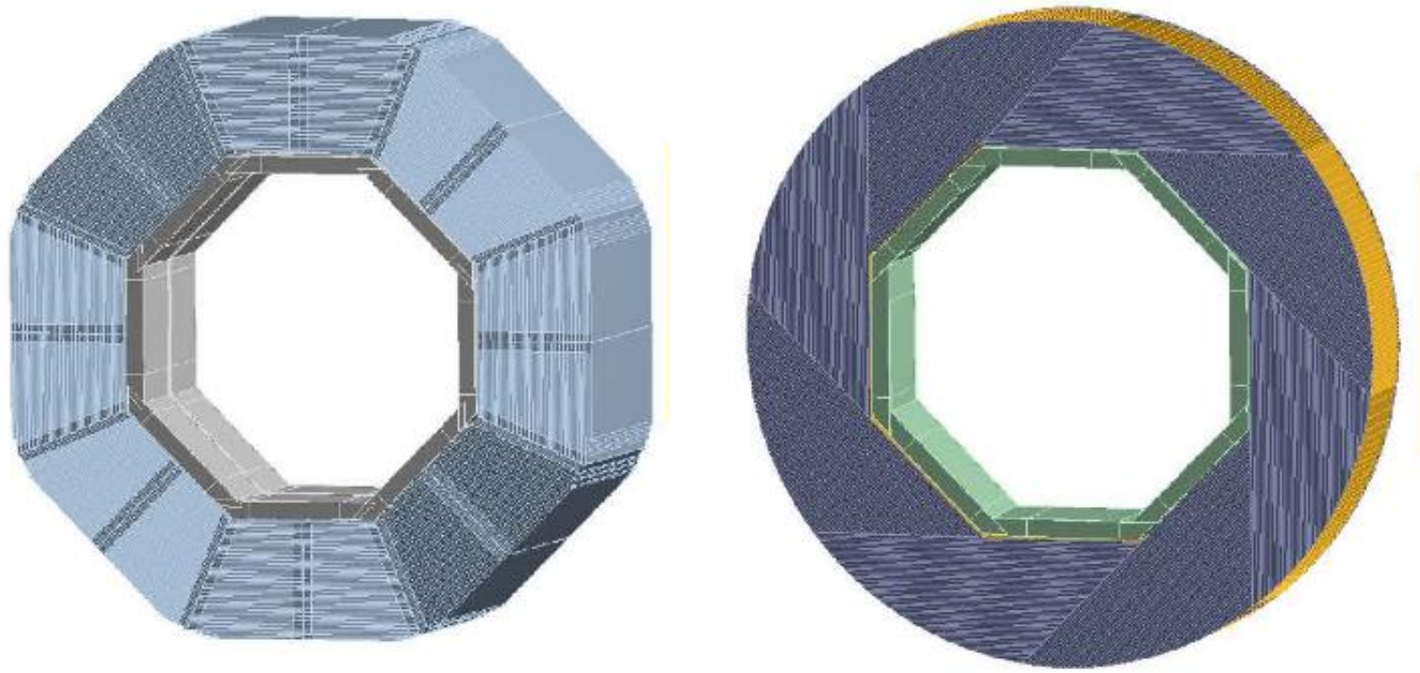
Airflow cooling test for ILD Forward Tracker



Much room for innovative solutions in these areas ! (e.g. MU3e He gas cooling, etc…)

SOME ENGINEERING ISSUES (cont'd): Global mechanical structure

Several options considered for HCAL global structure



Potential impact on:

- **Physics (cracks & dead material)**
- **Front-end accessibility**
- **Signal and cooling paths**
- **Seismic resilience**

Iron yoke size, magnetic fields and beam backgrounds
also strongly dependent on final Beam Delivery System and Detector Hall configuration
→ *dedicated studies needed*

SOME RESOURCES FOR ILC DETECTOR TECHNOLOGIES

ILD IDR and references therein (2020): https://arxiv.org/abs/2003.01116

DOE BRN for detector R&D (2020): https://www.osti.gov/servlets/purl/1659761

LCWS2021 detector sessions: https://indico.cern.ch/event/995633/

ECFA R&D panel symposia (2021): https://indico.cern.ch/event/957057/program

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…)

Regular ILC Software tutorials

grow and educate the community and newcomers

- organising a series of monthly seminars tutorials

- **Wednesdays**
  - **06:30 PDT / 15:30 CEST / 22:30 JST**
  - 60~90 minutes

- first one will be on **June 23**:
  - DELPHES ILC card (Filip Zarnecki)
  - “make your first ILC Higgs plot” (Jenny List)

- second one on **July 21**:
  - Introduction to iLCSoft (Thomas Madlener)

- future candidates: SGV, LCFIPlus, PandoraPFA, ddsim/DD4hep,…

- what do you want to see covered ?
  - send your suggestions to: **ilc-swc-coreATml.post.kek.jp**

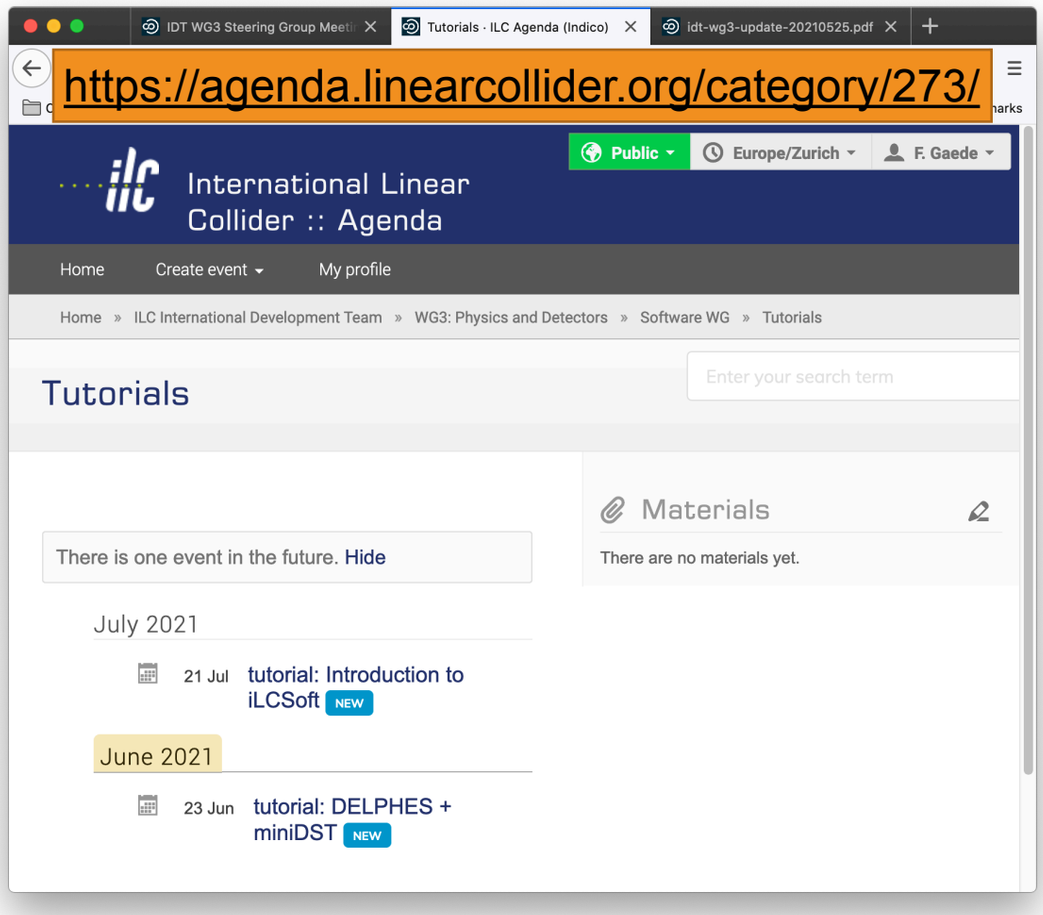


Table 1

Upcoming Tutorials:		
Aug 18th,	LCFIPlus:	https://agenda.linearcollider.org/event/9318/
Sep 15th,	SGV fast	simulation: https://agenda.linearcollider.org/event/9319/

Physics Potential and Opportunities Group

broad forum to discuss physics at the ILC facility, collider & non-collider, experiment & theory

- **conveners:** Michael Peskin (SLAC), Aidan Robson (Glasgow), Junping Tian (Tokyo) [Send email]
- **general entry point: https://linearcollider.org/team/wg3/physics/**
  - topical groups and their conveners (still some vacancies !):
    - **Higgs properties:**
      Shinya Kanemura (Osaka), Patrick Meade (Stony Brook), Chris Potter (Oregon), Georg Weiglein (DESY) [Send email]
    - **Top/heavy flavour/QCD:**
      Adrian Irles (Valencia), Alexander Mitov (Cambridge), Hua-Xing Zhu (Zhejiang) [Send email]
    - **BSM particle production:**
      Mikael Berggren (DESY), Shigeki Matsumoto (IPMU), Werner Porod (Wurzburg), Simone Pagan Griso (LBNL) [Send email]
    - **Electroweak physics:**
      Wolfgang Kilian (Siegen), Taikan Suehara (Kyushu), Graham Wilson (Kansas) [Send email]
    - **Global interpretations:**
      Tim Cohen (Oregon), Christophe Grojean (DESY), Sven Heinemeyer (Madrid), Sunghoon Jung (Seoul) [Send email]
    - **Modelling and precision theory:**
      Gudrun Heinrich (KIT), Stefan Hoeche (FNAL), Zhao Li (IHEP), Juergen Reuter (DESY) [Send email]
  - **sign up for mailing list(s):** https://agenda.linearcollider.org/event/9154/
  - **monthly open physics meetings:** https://agenda.linearcollider.org/category/266/
- short-term: contribute to ILC Snowmass document, medium-term: **ILC Resource Book 2024-25**

How to get involved

introduction to e+e- world; physics, detector and reconstruction topics; people to contact, …

- take a look at the “ILC Study Questions for Snowmass 2021” document, https://arxiv.org/abs/2007.03650
- public data sets (generator-level and fast sim) and other useful information: http://ilcsnowmass.org
- **both ILD & SiD offer very light-weight guest membership, allowing access to large-scale Geant4-simulated data sets**
- some **example projects** on the next slides, covering
  - detector optimisation
  - high-level reconstruction
  - physics analysis

Physics Analyses to be picked up

just a few example ideas, see Study-Questions document for much more…

- **charged Triple Gauge Couplings at 250 GeV:**
  objective: cTGCs are among the EW parameters which are tightly connected to the interpretation of Higgs precision data, eg in SMEFT. Already at 250 GeV, ILC is expected to improve substantially over current knowledge, in particular in any interpretation which considers more than one free parameter. Goal is to provide the first comprehensive projection based on full simulation, thereby controling important systematic effects via a nuisance parameter technique which is currently explored based on generator-level distributions.
  tools & methodology: Full simulation study at 250 GeV, including all relevant processes (WW, single-W etc), provide acceptance corrected production and decay angle spectra with statistical and systematic uncertainties, incorporation in SMEFT fit
- **Dark Sector potential at 250 GeV**:
  objective: Comprehensive survey of the ILC capabilities to discover or constrain dark sector models, identify e.g. special detector requirement for exotic signatures, compare reach with other collider and beam-dump experiments.
  tools & methodology: Depending on the channel, either full simulation or SGV, interaction with theorists to define parameter space to be scanned.
- **Higgs self-coupling at 500-600 GeV:**
  objective: Measurements of the triple-Higgs-coupling from ZHH will be one of the main targets of the second energy stage of the ILC, and is a key argument in the debate of Linear Colliders vs circular ee + hh. Last studies (~10 years old) were severely limited by reconstruction / analyses techniques and do not do justice to the state-of-the-art, therefore an update of the projections will have important impact on the ILC physics case. Furthermore, the impact of the exact choice of center-of-mass energy for the second stage should be evaluated.
  tools & methodology: revisit list of improvements from last analysis, study in particular ZZH vs ZHH separation based on state-of-the-art HLR and at 500, 550 and 600 GeV, investigate gain by machine learning.
- **Top Yukawa coupling at 500-600 GeV:**
  objective: Measurements of the top-Yukawa-coupling from ttH will be one of the main targets of the second energy stage of the ILC. Last studies (~10 years old) were severely limited by reconstruction / analyses techniques and do not do justice to the state-of-the-art, and a center-of-mass energy somewhat above 500 GeV could improve the expected precision by factors. Therefore an update of the projections will have important impact on the ILC physics case.
  tools & methodology: Revisit full simulation analysis at 500, 550 and 600 GeV, with state-of-the-art high-level reconstruction and explore potential gain by

High-level reconstruction algorithms to be developed

just a few example ideas, see Study-Questions document for much more…

- **systematic uncertainties:**
  objective: So far most physics projections are based on either rather ad-hoc assumptions on systematic uncertainties or even on statistical uncertainties only. For a precision machine like the ILC, however, maximizing the control of systematic effects and thereby minimizing their impact on the final physics output should be integral part of the detector (and accelerator) design. Goal is to develop a list of systematics which analyses typically should consider, and develop strategies and tools to estimate and minimize their impact.
  tools & methodology: start by making comprehensive list, methods reach from studies of calibration samples to discussions with subdetector groups / theorists.
- **reconstruction of V0s, kinks and prongs**:
  objective: The reconstruction of in-flight decays incl. V0s, kinks, prongs etc is a special strength of ILD due to its TPC. The current reconstruction exploits this strength only in a very rudimentary fashion. Realiable finding and constrained fitting of such decays could improve the overall reconstruction of jets as well as enable searches for exotic long-lived particles, i.e. from Dark Sector models. Evaluate wrt Si-only tracking.
  tools & methodology: full ILD simulation, review, unify and improve treatment of in-flight decays before and after particle flow. Exploit dE/dx for PID, develop constrained fitting.
- **photon reconstruction:**
  objective: Reconstructed well calibrated and unbiased estimates of photon 4-vectors with understood measurement uncertainties are essential for more sophisticated uses of photons such as in brems recovery for leptons, mass-constrained fits, pi0 reconstruction, jet error parametrisation etc. Understand and exploit the full potential of a highly-granular ECal, and (in case of ILD) of the continuous tracking (photon conversions).
  tools & methodology: full ILD simulation, review and revise photon calibrations and error estimates apply to cases listed above.
- **jet clustering with PFO uncertainties:**
  objective: For final-states with more than 2 jets, usually the jet clustering mistakes dominate the JER. Jet algorithms used so far are mainly the ones developed for LEP (with the exception of the Valenica algorithm). None of them exploits the full information provided by a particle flow detector, which includes reliable uncertainty estimates for each PFO (aka ErrorFlow) - how can this information be used in jet clustering?
  tools & methodology: Either "classically": develop new distance measures and recombination schemes which take into account ErrorFlow information - or employ machine learning!

Detector optimisation questions

just a few example ideas, see Study-Questions document for much more…

- **incorporation of fast timing:**
  objective: With time resolutions at the level of a few 10ps becoming conceivable, a proposal should be made if and how fast timing could be implemented into PFlow-optimised detectors. Possible use-cases reach from rejection of out-of-time backgrounds via 5D Particle Flow to particle identification (ToF).
  tools & methodology: current simulation and reconstruction provides hits from the outer most tracker layer and the first 10 layers of the ECal with "perfect" timing and smeared by various assumed time resolutions. Based on these, formulate requirements for the various use cases, and estimate potential benefit, discuss these requirements with the relevant sub-detector groups, formulate proposal of how to implement timing and what R&D would be needed.
- **tracker alignment**:
  objective: estimate need of tracks to align tracking system eg after push-pull, determine achievable level of precision and residual systematics for standard running scenario, quantify amount of data eg at Z pole to significantly improve residual systematic uncertainties. How many cosmics would reach the deep ILC IP location?
  tools & methodology: Mis-align tracker components in simulation (is supported by DD4HEP) and evaluate impact of various types / sizes of mis-alignments. Develop strategy for track-based alignment. Quantify residual uncertainties as a function of the available luminosity at each energy.
- **ILD-specific: re-optimisation of inner silicon tracker design:**
  objective: The efficiency to find secondary vertices in forward direction is limited in current ILD design, e.g. due to relatively large gap between end of VTX barrel and first FTD disk, which is in turn related to the Faraday cage of the VTX and services in this area. Eg CLICdp takes a completely different approach with its "spiraling" forward vertex detector. Could a CLICdp-like approach also improve ILD? Are there other ideas for better - and yet realistic layouts of VTX /FTD? Are there any benefits from making SIT part of the vertex detector?
  tools & methodology: DD4HEP, start from ILD_l5_v02, modify VTX/FTD transition, and/or try to plug-in CLICdp vertex detector. Compare resolutions and efficiencies / purities to ILD_l5_v02, both at track-level and at vertex-level

Future open scientific meetings

- Initially: regular monthly open scientific meetings,
each organised by 2–3 Topical Groups – frequency will increase gradually as more people join. Schedule:
  - **Thursday 17th June**, 3pm CEST
  - **Thursday 15th July**, 3pm CEST
  - **Thursday 12th August**, 3pm CEST
  - **Thursday 16th September**, 3pm CEST

Global Interpretations and BSM talks including: Status update on EFT fits
Connecting UV models to EFTs

- All listed on indico (linked from main WG3 Physics webpage)
https://agenda.linearcollider.org/category/266/

- Sign-up for mailing lists, overall WG3 and topical lists:
https://agenda.linearcollider.org/event/9154/

ilc newsline

PREPRINTS

1 JUNE 2021

2105.12962
Physics reach of a long-lived particle detector at Belle II

2105.12276
Optimization of a traveling wave superconducting radiofrequency cavity for upgrading the International Linear Collider

2105.11189
A 96 GeV Higgs Boson in the 2HDMS: e+e− collider prospects

2105.11015
A high luminosity superconducting twin e+e− linear collider with energy recovery

2105.08616
Stau searches at the ILC

2105.07230
A new analysis of the pQCD contributions to the electroweak parameter ρ using the single-scale approach of principle of maximum conformality

2105.06665
Study of the hγZ coupling at the ILC

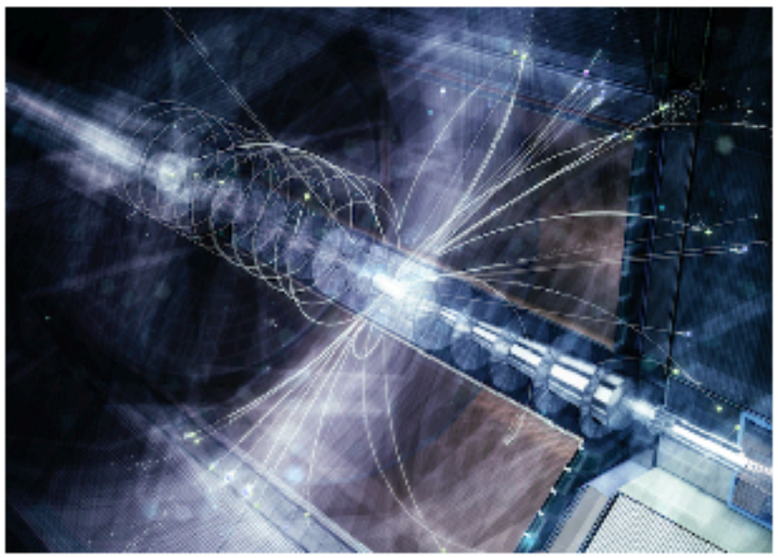
2105.06585
SDHCAL technological prototype test beam results

ANNOUNCEMENTS

ILCX 2021: Let's discuss about possible experimental opportunities at the ILC

Hitoshi Murayama | 1 June 2021

The ILC International Development Team (IDT) will hold the ILC Workshop on Potential ILC Experiments (ILCX) , from 26 – 29 October, 2021.



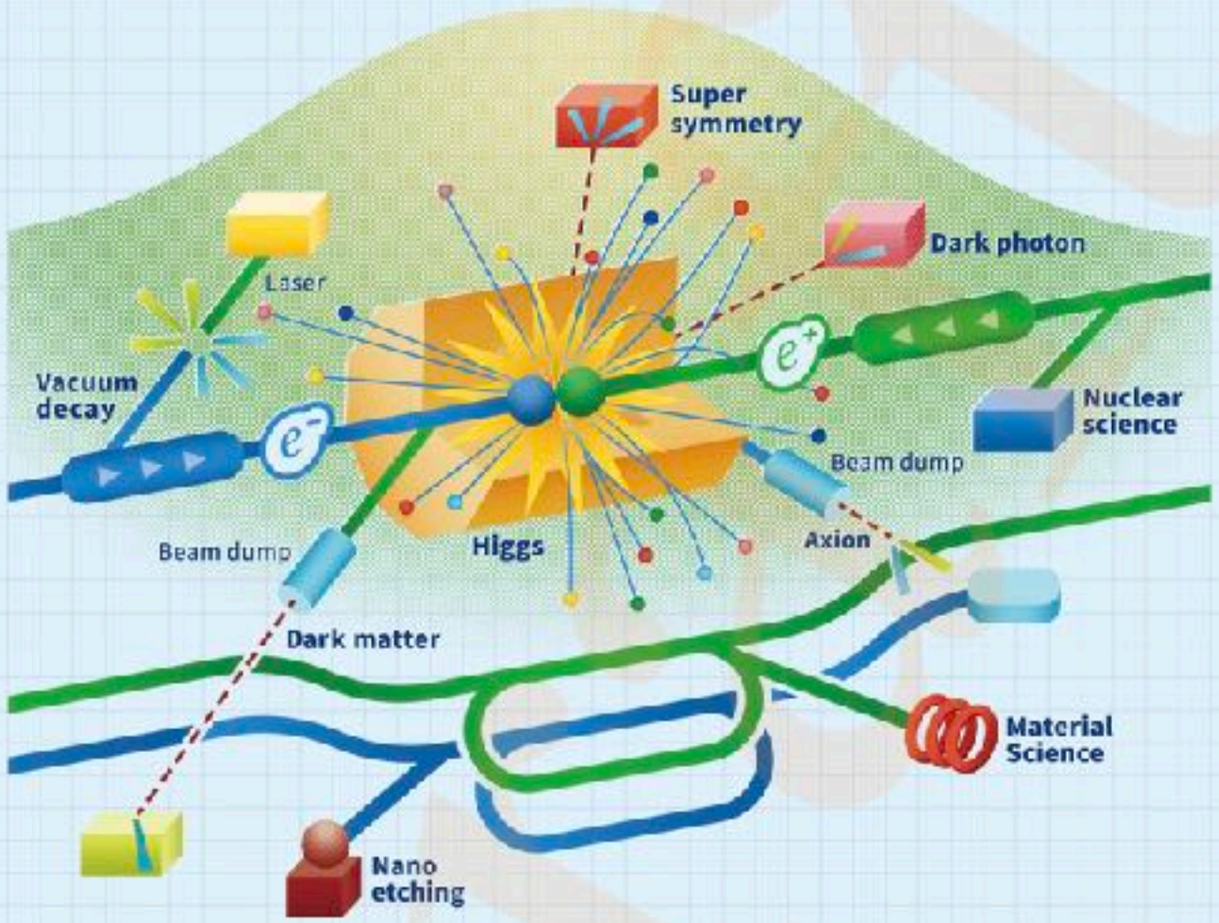
ILC collision image. Image: Rey. Hori

With the growing anticipation that the preparatory laboratory (Pre-lab) will be launched in the near future, we would like to initiate serious discussions about all the possible experimental opportunities at the ILC laboratory. The workshop will address all the aspects of the collider program at the Interaction Point (IP), including ideas for new detector technologies or concepts, detector performance and physics reach, software and computing, and theoretical developments. In addition, possible beam dump experiments, forward detectors near the IP, off-axis far detectors, experiments with extracted beams for particle physics and other areas of science, including e.g. nuclear physics, condensed matter physics. Some of these ideas will require additional infrastructure and civil engineering, and therefore need to be incorporated into the ILC site planning during the four years of the Pre-lab, hence discussions is needed rather soon.

The workshop organizing committee is the Executive Board of IDT, and the program committee is the Steering Group of Working Group 3 (Physics and Detector). Given the uncertainties with the COVID-19 situation, three possible styles are being prepared in parallel: (1) in-person meeting in Tsukuba, Japan, (2) hybrid meeting on the KEK site, and (3) fully online meeting. Decision between (1) vs (2,3) will come by the end of June. In the case of in-person meeting, a visit to ILC-related sites at KEK is being arranged on Oct 25, while an excursion to the candidate ILC site in Tohoku is being planned after the workshop.

The ILCX2021 website has opened. Since how we organize the meeting has not yet decided, registration is not open. Please stay tuned for more information!

ILCX2021 ILC Workshop on Potential Experiments



26–29 October 2021, Tsukuba, Japan

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Toward opening pre-registration

- **1st circular (responsible: Hitoshi & WG3)**
  - template prepared by LOC, being finalized by Hitoshi
- **Website update (responsible: LOC)**
  - temporary update done last Friday (on 9 July)
  - need additional update based on 1st circular
    - preparing registration page including a form for new experimental ideas (need a confirmation from WG3)
- **Poster (responsible: LOC)**
  - need minor corrections (see attached draft)
  - final version on the web before opening pre-registration

Planing to start pre-registration as soon as possible (hopefully next week)

Plan-A (hybrid) & Plan-B (full-online)

	Day 1 (Tue) 26 Oct	Day 2 (Wed) 27 Oct	Day 3 (Thu) 28 Oct	Day 4 (Fri) 29 Oct
13:00 - 15:00	Parallel (max. 6 sessions)	Parallel (max. 6 sessions)	Parallel (max. 6 sessions)	**Plenary** (summary session)
15:30 - 17:30	Parallel (max. 6 sessions)	Parallel (max. 6 sessions)	Parallel (max. 6 sessions)	Parallel (max. 6 sessions)
19:00 - 21:00	Parallel (max. 6 sessions)	Parallel (max. 6 sessions)	Parallel (max. 6 sessions)	**Plenary** (summary session)
21:30 - 23:30	**Plenary**	**Plenary**	**Plenary**	**Plenary** (discuss next steps)

- **Venue for Plan-A:** KEK Tsukuba campus (~30 min from hotels by bus)
- **LOC preference:** shuttle bus departure before midnight, serve lunch/dinner at KEK
- **# of plenary talks:** 20 min x 24 talks + 20 min x 12 summary talks
- **4 time slots (two hours each):** expect much more parallel talks than Plan-C (in-person)
  - 13:00-15:00 JST (6:00-8:00 CEST, **0:00-2:00 EDT**, 21:00-23:00 PDT)
  - 15:30-17:30 JST (8:30-10:30 CEST, **2:30-4:30 EDT**, **23:30-1:30 PDT**)
  - 19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, **3:00-5:00 PDT**)
  - 21:30-23:30 JST (14:30-16:30 CEST, 8:30-10:30 EDT, 5:30-7:30 PDT)

  CEST: Central European Summer Time, EDT: Eastern Daylight Time, PDT: Pacific Daylight Time
- **Optional program:**
  - In the morning: KEK facility tour, on-site satellite meetings etc.
  - On Monday (one day before Day 1): Excursion to Iwate (ILC candidate site etc.)

parallel sessions

- Software/computing
- Calorimeters
- Tracking Detectors
- New Technologies & Ideas for Collider Detectors
- Industry Forum
- six topical groups: Higgs properties, Top/heavy flavour/QCD, BSM particle production, Electroweak physics, Global interpretations, Modeling and precision theory
- transversal task forces: MDI-CFS, MDI-BDS, D&T performance studies, MC sample production, communication, Fixed Target/ Dark Sectors
- detector engineering (material support, cooling, power) detector conveners
- a few sessions on machine (to be coordinated with WG2)

international linear collider

http://newsline.linearcollider.org

monthly ilc newsline

Rika Takahashi (KEK)

Barbara Warmbein (DESY)

Perrine Royole-Degieux (IN2P3)

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

TAG CLOUD

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

DIRECTOR'S CORNER

ILC Pre-Lab preparation on the accelerator

by Shinichiro Michizono

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

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 Suzuki, president of the Iwate Prefectural University and former director general of KEK chairs

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

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ILC (International Linear Collider) Retweeted

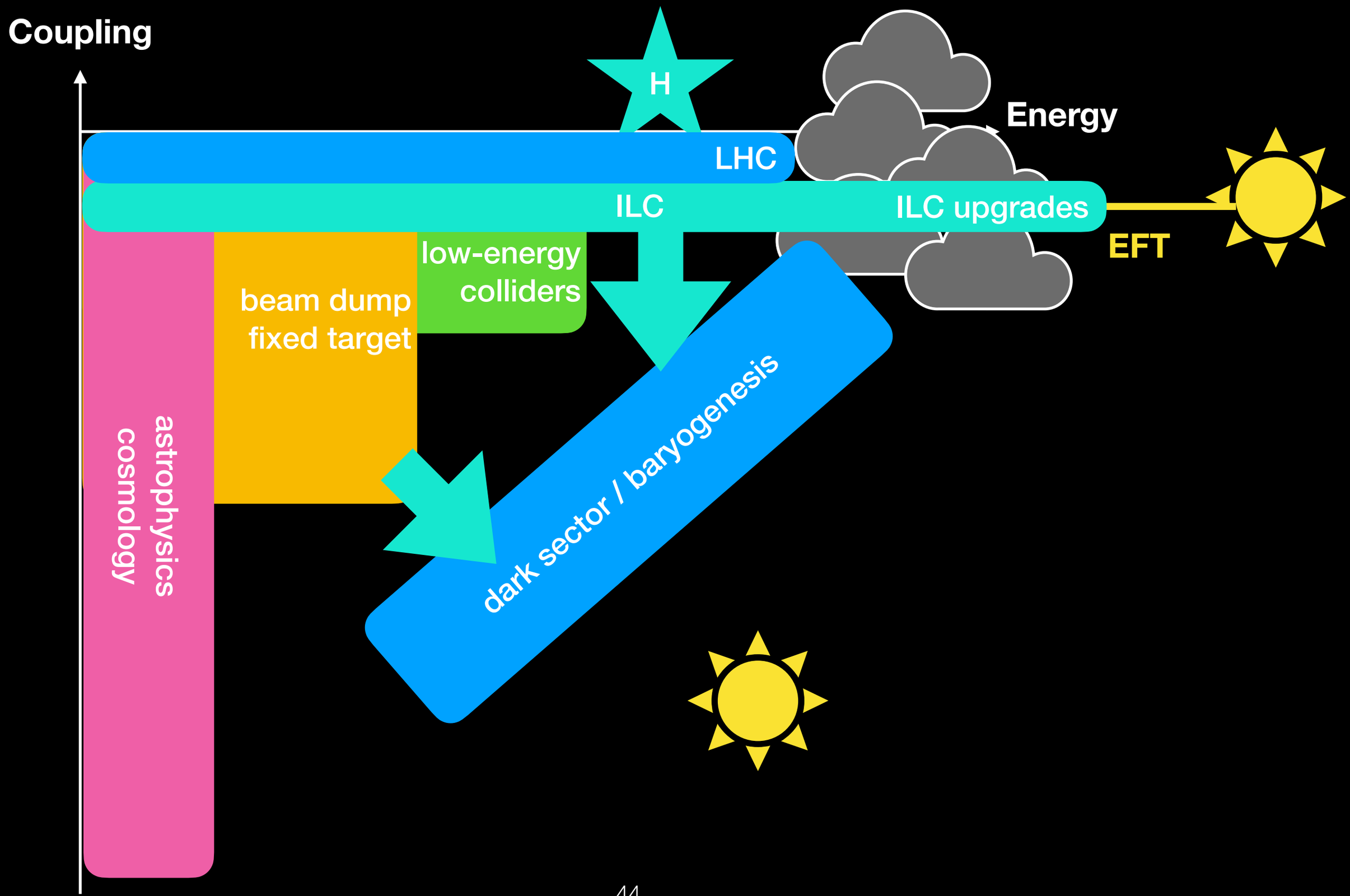
CERN Courier @CERNCourier · 16h

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

ILC 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 3–4 years
- new opportunities
  - beam dump, off IP, extracted beams
- new organization of working groups launched
  - please join!

ILC++


Coupling
Energy
H
LHC
ILC
ILC upgrades
EFT
low-energy colliders
beam dump fixed target
astrophysics cosmology
dark sector / baryogenesis

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