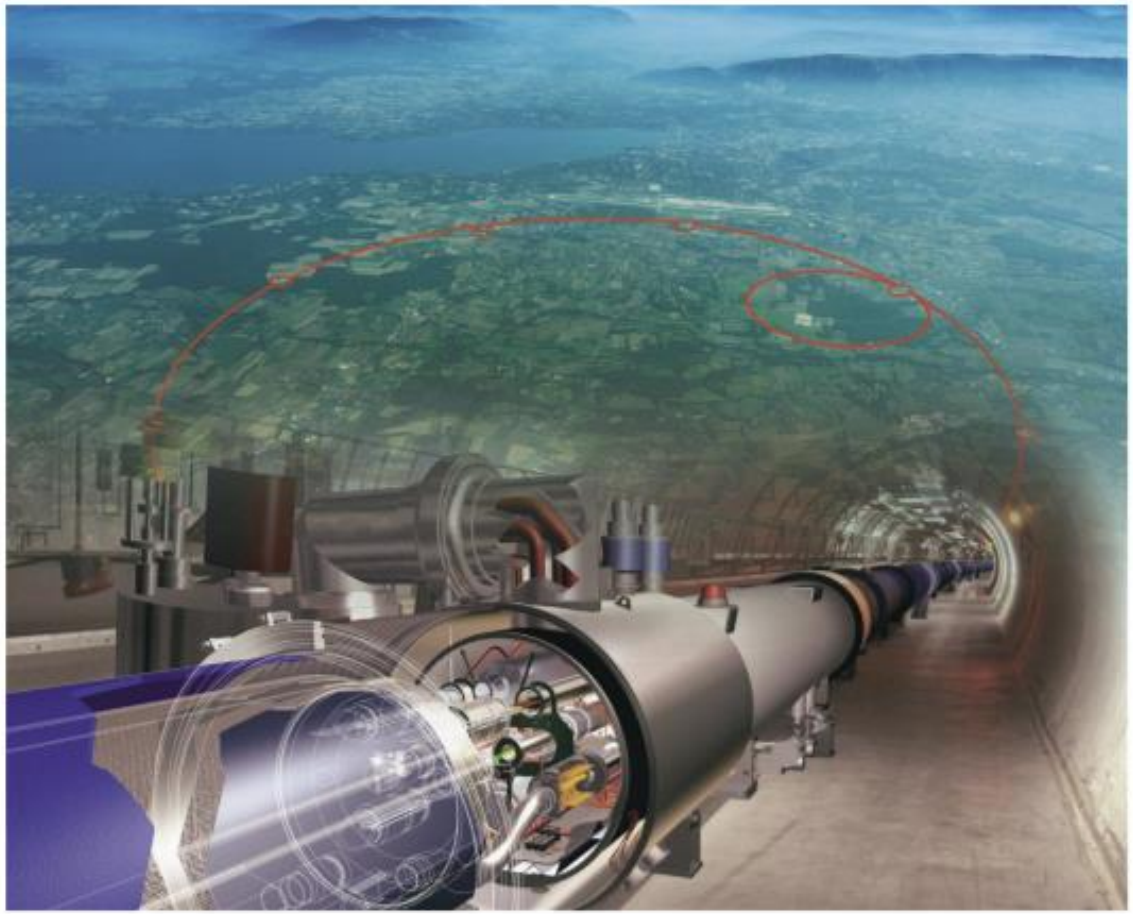
ECFA

European Committee for Future Accelerators



ECFA: A. Ferrari, R. Pasechnik

RECFA: D: Milstead

European Committee for Future Accelerators

- Plenary ECFA, Restricted ECFA
- Primary aim is the planning of the high-energy facilities including accelerators, large-scale experiments, technologies and equipment necessary for particle physics research by the community of participating European countries
- Activities
  - Regular meetings
  - Symposia/seminars/conferences sponsored/organized by ECFA
  - Study groups set up by ECFA or with other organisations at special problems
  - Collecting/sharing/implementing/monitoring views/trends across Europe
  - (RECFA) visits to individual countries

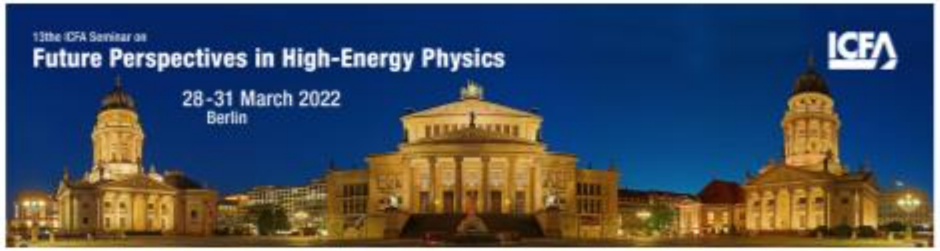
RECFA visits and Covid

- Country visits more or less suspended for the past year
- Tentatively planned resumption
  - Denmark 3/4 Dec 2021
  - Italy: 4/5 March 2022
  - Germany: 1/2 April 2022
  - Ukraine: 13/14 May 2022
  - Hungary: 23/24 September 2022
  - Israel: 3/4 November 2022

ECFA Schedule 2022

(i) ICFA Seminar in Berlin, 28 – 31 March 2022
(European quota: 50 seats (incl. 1… proposal on shari… …ut and discussed)
ht… …y.de/

Cancelled, moved to a later date (not yet known)



(ii) ECFA Plenary Meeting in summer 2022

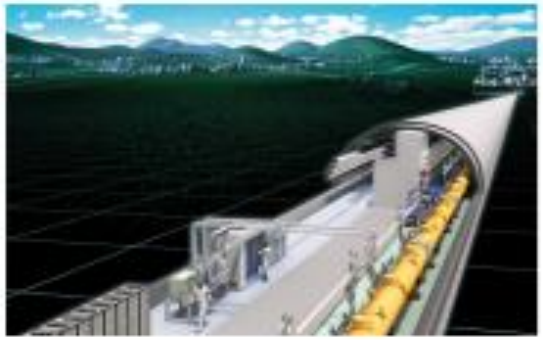
- Tradition to have the summer P-ECFA meeting in non-EPS years, e.g. 2022, at a major institution in Europe.
- The 2020 meeting, planned to be held at JINR Dubna, was cancelled due to the 1st Corona wave; When cancelled it was agreed that JINR would get priority for the 2022 meeting, if they would apply.
- JINR is very strongly interested to host that meeting also in 2022, we have received an updated proposal, and RECFA has accepted this proposal

→ Next Plenary ECFA meeting will be held in Dubna on **21 / 22 July 2022 (Thur./Friday)**

ECFA statement (endorsed at the Plenary ECFA meeting on 13 July 2020)

- *ECFA recognizes the need for the experimental and theoretical communities involved in physics studies, experiment designs and detector technologies at future Higgs factories to gather.* ***ECFA supports a series of workshops*** *with the aim to* ***share challenges and expertise, to explore synergies in their efforts*** *and to respond coherently to this priority in the European Strategy for Particle Physics (ESPP).*

Goal: bring the entire e^+e^- Higgs factory effort together, foster cooperation across various projects; collaborative research programmes are to emerge



- Setting up an **International Advisory Committee (IAC)** was agreed to be the next step with involvement of some RECFA members and European leaders of possible future Higgs factories. In addition, the (HL)-LHC community should be represented.

- Identifying thematic areas on specific topics where concrete work should be organised, following the ECFA mandate

- Contacting experts from existing communities working for future e^+e^- colliders, LHC, Belle, …
  for each of five planned working groups

- Working groups planned on:
  - Global interpretation in (SM)EFT and UV complete models
  - Flavour physics
  - Higgs, top and electroweak physics, incl. high-p_T
  - Precision calculations and theoretical, parametric and experimental syst. uncertainties
  - Direct discovery potential, incl. FIP

- In addition, a Seminar Series is planned

- ***First Topical Meeting on Generators*** on 9/10th November: https://indico.cern.ch/event/1078675/
  (common workshop for WG1 and WG2)

  More extended presentation in
  Open Plenary ECFA Meeting on 19th November https://indico.cern.ch/event/1085137/

Detector R&D roadmap : page: https://indico.cern.ch/event/1090779/

_Identifying the Tools

"It is vital to build on Europe's world-leading capabilities in sensor technologies for particle detection."

The figure opposite illustrates the "Detector R&D Themes" (**DRDTs**) and "Detector Community Themes" (**DCTs**) identified in the roadmap process, grouped according to the areas addressed by the nine task forces set up by ECFA to develop a strategy for future detector R&D priorities. All the themes are critical to achieving the science programme outlined in the ESPP and are derived from the technological challenges that need to be overcome for the scientific potential of the future facilities and projects listed in the ESPP to be realised. It is important to ensure that, for each of the future facilities mentioned in the ESPP, detector readiness should not be the limiting factor in terms of when the facility in question can be realised. In many cases, less demanding developments are required for experiments scheduled in the medium term, which can then act as "stepping stones" (illustrated by the in-between dots) towards achieving the final specifications.

The R&D priorities are outlined for the key detector types: those based on gaseous, liquid or solid sensing materials; along with those required for sensing aspects specific to photon detection, particle identification (PID) or energy measurement (calorimetry). In addition, quantum sensors are already offering radically new opportunities to particle physics, and their further development will widen their applicability to the field. Sophisticated read-out technologies are essential to all detector types and are often the limiting factor when very large numbers of channels are to be instrumented, especially given the ever more demanding sensitivity and robustness required for operation in the extreme conditions of many particle physics experiments. Unique advanced engineering solutions are needed to complement all these detector developments and, as with accelerators, the field drives many aspects of progress in magnet technology. Last but not least, environmental sustainability is a central requirement for all future research and innovation activities.

Given the vital importance of expertise in a wide range of cutting-edge technologies, the detector R&D roadmap also contains specific recommendations in terms of training. Detector Community Themes with emphasis on providing better coordination between the many different training schemes available across Europe and exploring mechanisms to establish a core syllabus for a Masters qualification in particle physics instrumentation, that brings together the crucial elements from the large number of diverse existing courses. Given the uneven access to training in the area of instrumentation in all regions of the world, a key focus is to greatly improve the inclusivity of future programmes, workshops and schools, encouraging the widest possible diversity of participants.

While defining the priorities within particle physics, as outlined above, the ECFA Detector R&D Roadmap also emphasises the vital importance of benefiting from synergies with adjacent research fields, knowledge institutions and high-technology industries.

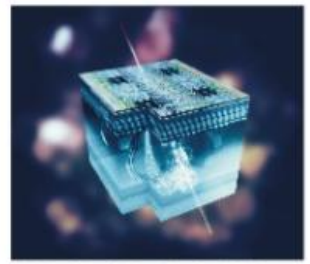


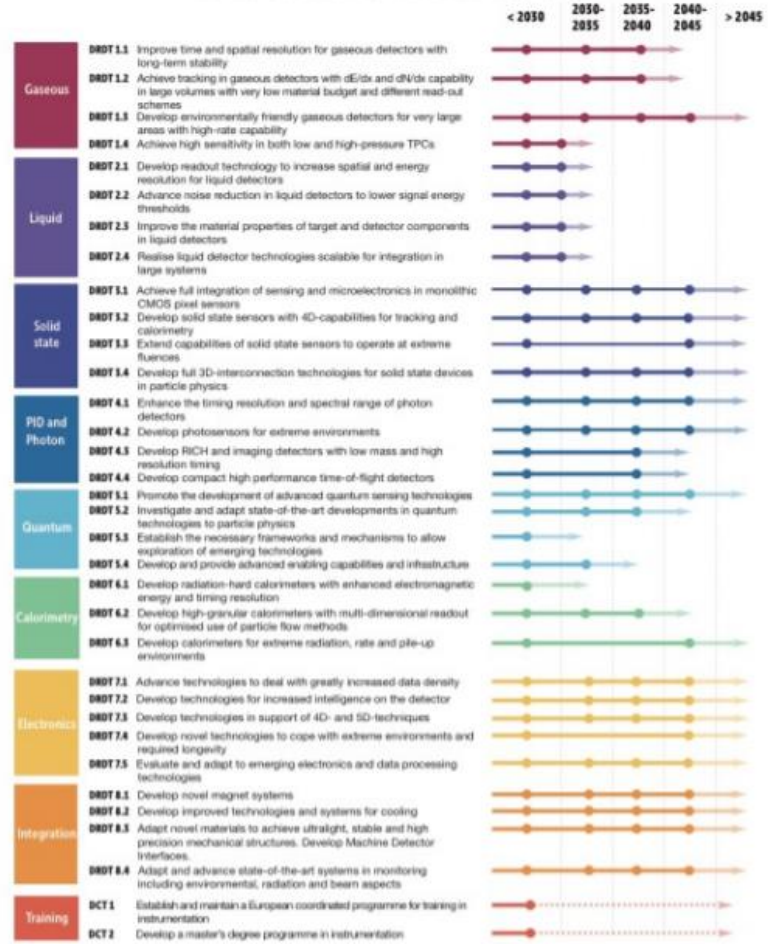
Illustration of microelectronics circuitry integrated with a detecting medium as a single monolithic solid-state detector. (© ALICE collaboration)

Paul Scherrer Institute (Switzerland) Facility for Delivering Highly Targeted Radiotherapy with Beams of Accelerated Protons (Proton Therapy). (© Scanderbeg Sauer Photography/ PSI)

Bespoke cleanroom facility for detector R&D, testing and assembly targeting LHC upgrades, future collider facilities and medical applications.(© BILPA, University of Birmingham)

Students and young scientists working on the construction of prototype detector modules. (© CERN)

DETECTOR RESEARCH AND DEVELOPMENT THEMES (DRDTs) & DETECTOR COMMUNITY THEMES (DCTs)



Detector R&D Themes (DRDTs) and Detector Community Themes (DCTs). Here, except in the DCT case, the final dot position represents the target date for completion of the R&D required by the latest known future facility/experiment for which an R&D programme would still be needed in that area. The time from that dot to the end of the arrow represents the further time to be anticipated for experiment-specific prototyping, procurement, construction, installation and commissioning. Earlier dots represent the time-frame of intermediate "stepping stone" projects where dates for the corresponding facilities/experiments are known. (Note that R&D for Liquid Detectors will be needed far into the future, however the DRDT lines for these end in the period 2030-35 because developments in that field are rapid and it is not possible today to reasonably estimate the dates for projects requiring longer-term R&D. Similarly, dotted lines for the DCT case indicate that beyond the initial programmes, the activities will need to be sustained going forward in support of the instrumentation R&D activities).

Detector R&D Roadmap

In addition to the Detector R&D Themes described above and discussed in each chapter the following General Strategic Recommendations are made under the following headings.

GSR 1 - Supporting R&D facilities

GSR 2 - Engineering support for detector R&D

GSR 3 - Specific software for instrumentation

GSR 4 - International coordination and organisation of R&D activities

GSR 5 - Distributed R&D activities with centralised facilities

GSR 6 - Establish long-term strategic funding programmes

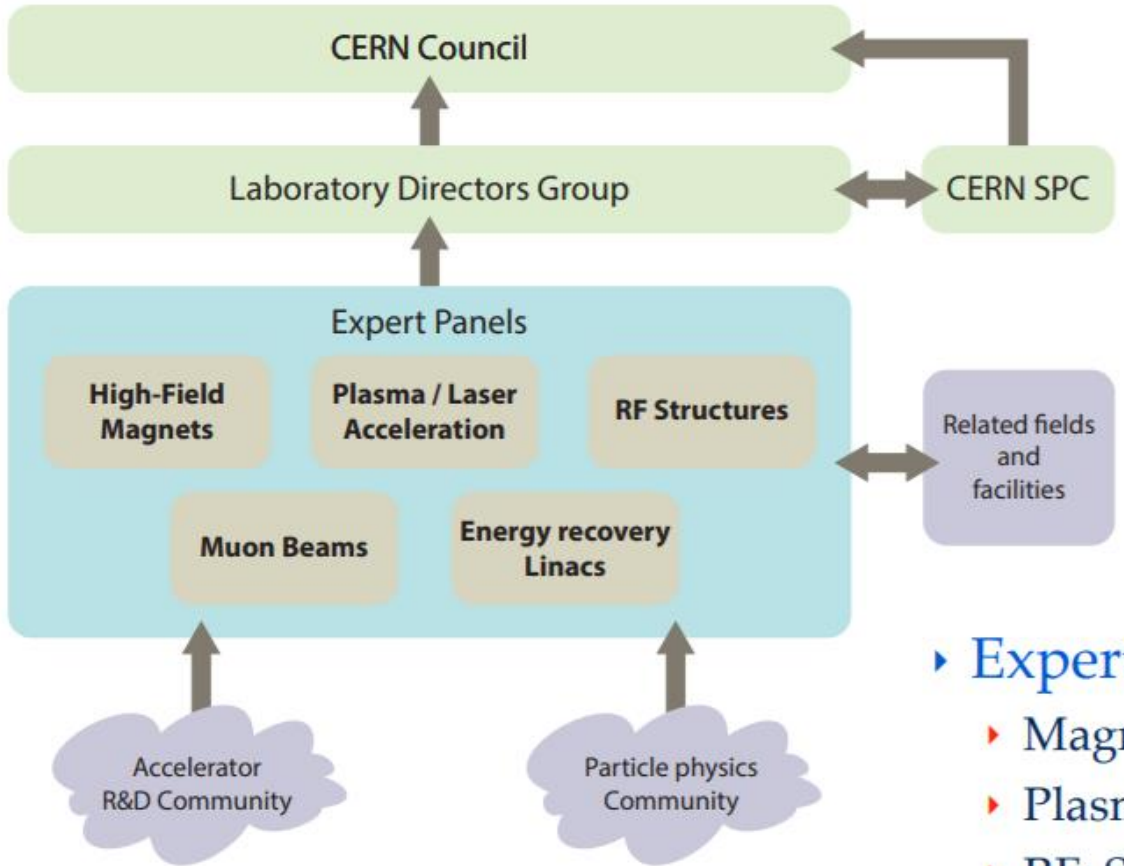
GSR 7 - Blue-sky R&D

GSR 8 - Attract, nurture, recognise and sustain the careers of R&D experts

GSR 9 - Industrial partnerships

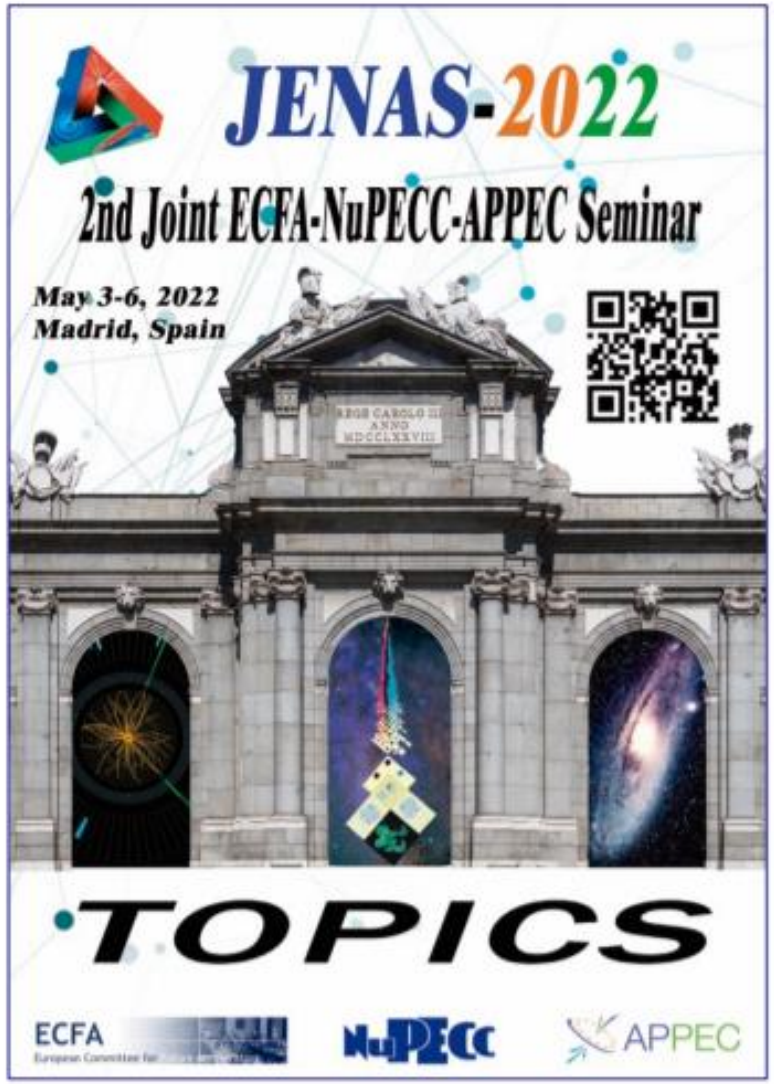
GSR 10 - Open Science

Accelerator R&D Roadmap



- Expert panel chairs
  - Magnets: P. Vedrine (IRFU)
  - Plasma: R. Assmann (DESY)
  - RF: S. Bousson (IJCLab)
  - Muons: D. Schulte (CERN)
  - ERL: M. Klein (Liverpool)
  - Co-opted authors for additional sections

4. Next JENA Seminar in Madrid 2022



2nd JENAS will take place in **Madrid** (3 – 6 May 2022);

- Advanced version of the programme worked out in several meetings between APPEC, NuPECC and ECFA Chairs and the local organisers

  (→ following two pages)

- Speakers assigned (based on proposals from e.g. RECFA) and contacted very recently

- It was decided to invite representatives of Funding Agencies

  Topics:
  - Present the Science Case, Big Questions
  - Detector R&D, Computing;
    Discussion on (additional, common) funding for these activities;
  - Governance models for large facilities
  - …

5. Diversity Working Group Activities

Patricia Conde Muino

- Re-distributed the Diversity Charter in summer to Collaborations
  - Overall positive replies from ATLAS, CMS, ALICE, LHCb, ALICE, NA61/SHINE, NA62
    - Questions on the survey raised by several collaborations, mainly on data protection issues, sharing of results, …
  - Few signatures collected (after CB endorsement), others underway

- Distribution of the Diversity Charter to conferences:
  - EPS-HEP, PANIC2021, ICR2021
  - Collected ~140 answers from EPS (1933 participants!), 68 from PANIC (out of 548 participants)
  - Strong encouragement very important!

- Next steps:
  - Patricia Conde Muino will keep following this up (contact to Collaborations)
  - Start analysis of the data; deadline end of January 2022 for input;
  - Report at JENAS in Madrid in May 2022 (→ Patricia Conde Muino)

ECFA Early Career Researchers Panel

- Formed in 2020, 75 delegates (see website for full list)
  - ~3 delegates from each ECFA country and each major laboratory
    - Ph.D. students, post-docs, non-tenured faculty

Sweden ECFA-ECR Representatives	
Name	**Affiliation**
Katherine Dunne	Stockholm University
Neven Blaskovic Kraljevic	Lund University
Giulia Ripellino	KTH

2021 Report from Detector R&D Roadmap Working Group

- **Early Career Perspectives on Training in Instrumentation:** arXiv:physics.ins-det/2107.05739

Current Working Groups

- **Networking for Early Career Researchers in Instrumentation:** *Event series planned for bringing together senior and early career members in instrumentation. First event planned for Feb 2022*
- **Career prospects: Getting out of the limbo**: *Discuss all important aspects of ECR career development*
- **Electron-Ion Colliders:** *Raise awareness of EIC physics and to mutually benefit from a synergy with other ECRs working on accepted/foreseen EIC projects*
- **Diversity in Physics Programme:** *Promote diversity in European experimental programmes and to recognise problems regarding life of ECRs in small scientific communities*

Summary

- ECFA/RECFA activities carried on under Covid
  - Many RECFA country visits were cancelled
- Road-maps
  - Detector
  - Accelerator
- Focus on exploitation of an e+e- Higgs factory
- Push for Jenas (cross-disciplinary)
- Active diversity program

Future accelerators ? Tectonic plates continue to shift

Prelab is linked to approval of ILC

Yamauchi-san asked patiently MEXT to go PreLab

Message from MEXT (March 2021)

Message given by the MEXT Minister

- The ILC project needs to resolve its various challenges including its international cost sharing and technical feasibility, as well as to obtain broad internal and external cooperation not for its pre-laboratory but for the ILC project itself.

- Under the current situation that the perspective of broad internal and external cooperation for the ILC project itself as well as its pre-laboratory is not promised, it is difficult to obtain the people's understanding in Japan for investing the pre-laboratory. It is necessary to obtain the clear perspectives on financial contributions to the ILC project itself from the US and European countries in prior considering the pre-laboratory."

Three keys to move ILC forward given by MEXT:

1. Technical feasibility (← Prelab)
2. International cost sharing (← Governments, IDT, Phys. community)
3. Broad consensus in Japan (← Japanese phys. community)

All of you frustrate to Japanese Gov. MEXT

There are two serious problems to move Pre-Lab soon (By MEXT)

1) International discussion is low key
2) Which Budget? Not clear -> academic communities strongly against ILC
   They afraid budget cut for the other projects, if ILC go.

Not official statement
Just My Opinion

MEXT considers ILC is the same as "ITER"

A) International Lab. -> Cost sharing negotiations are very tough.
   MEXT is low key, many counties also low key.
B) If Japan shows initiative -> shortage of cost should be covered by MEXT?
   (In ITER, Int, treaty is used to collect budget, but does not work)
C) No strong Leadership in Government -> Budget is not clear

ITER is trauma for MEXT

But MEXT requires us
ILC has to have the International and domestic framework similar to ITER.
Otherwise we can not solve these problems.