# Report from Physics WG

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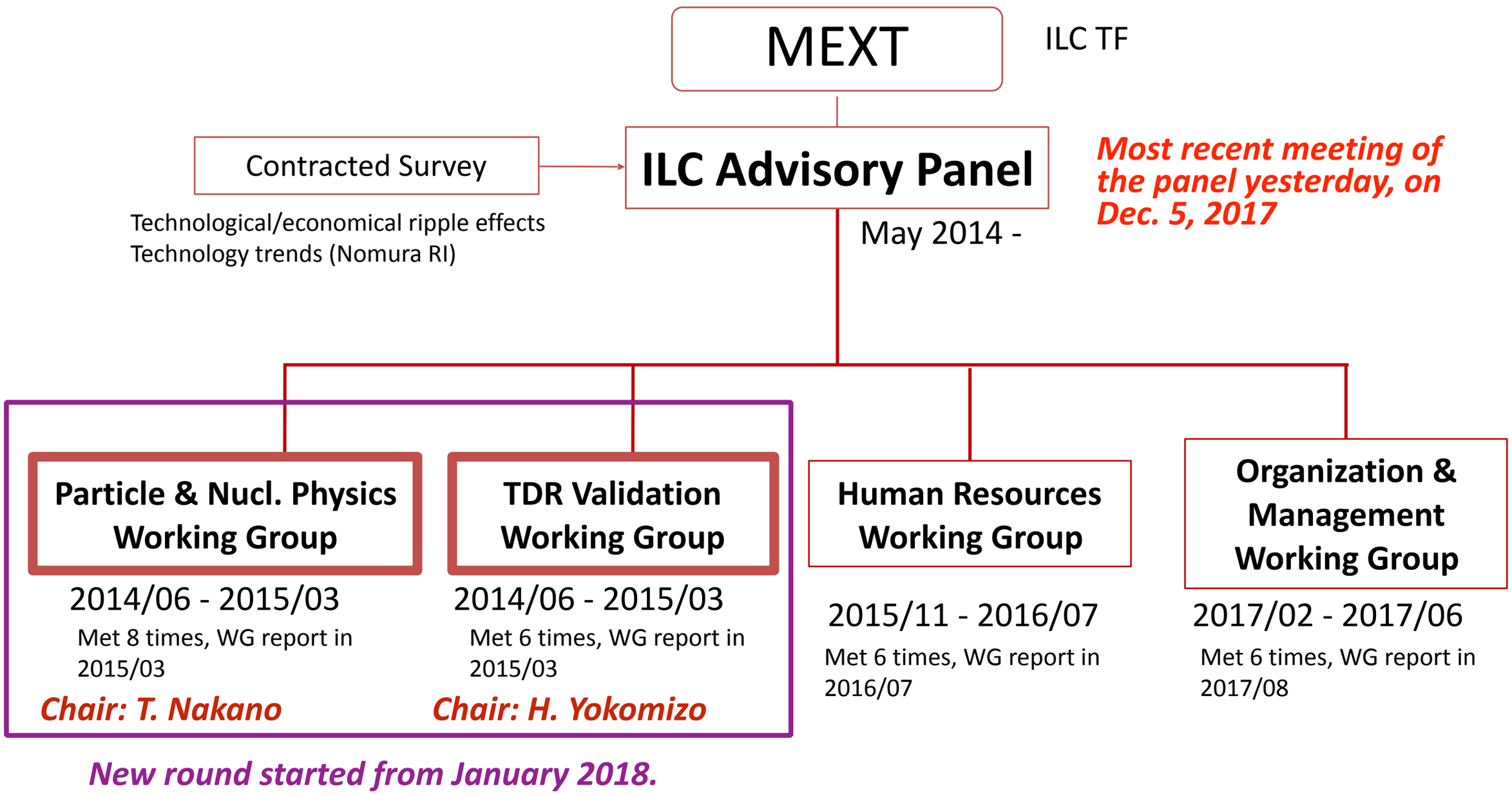
on behalf of the Physics WG
March 7, 2018

# MEXT Review

# *ILC Advisory Panel*

Set up in May 2014 under MEXT ILC Task Force to investigate various issues concerning the possibility of hosting the ILC in Japan




http://www.mext.go.jp/b_menu/shingi/chousa/shinkou/038/index.htm

# *The 3rd Meeting of the Particle & Nuclear Physics WG happened on*

# *March 1, 2018*

***Agenda:***

- ***Physics Case of the 250 GeV ILC***
  1. ***A draft skeleton of the WG report: Key points to be included in the report***
  2. ***A table comparing the physics case of the 500 GeV ILC and that of the 250 GeV ILC***
- ***AOB***

# Draft Skeleton of the WG Report

*Introduction (background info.)*

1. *LHC Run II results*
   - *So far no clear signal of BSM physics, suggesting scenario 3 (no new particle/phenomenon)*
2. *Physics case of ILC250*
   - *Interim report: (1) h&t, (2) NP such as SUSY, (3) others (DM, XD)*
   - *As for (2), discovery potential low even for ILC500, much lower for ILC250.*
   - *As for (1), $\sigma_{Zh}$ maximum at 250 GeV, though below top-pair threshold. LHC results justifies EFT and precision Higgs coupling measurements at 250 GeV.*
   - *The most important goal of ILC250 is to look for BSM effects through the precision Higgs coupling measurements. The deviation pattern is expected to show us the direction of the future particle physics.*
   - *As for (3), prospects for searches using recoil mass technique will remain the same.*
   - *New particle searches in general require energy above 1 TeV and hence should take into account new technology.*

# Draft Skeleton of the WG Report

3. *Examples of XFEL and FAIR*
   - *LCB statement*
   - *Host's share and international cooperation (XFEL case)*
   - *Host's share and international cooperation (FAIR case)*
4. *Scenario for ILC250 (based on the LHC Run II results)*
   - *Interim report's scenario 3:*
     - *Research program: BSM searches through precision h&t, NP searches in LHC's blind spot, plan for future E-upgrade.*
     - *Prospects: Size and pattern of deviations from SM, if any, will tell us the nature of BSM physics and its energy scale. Once a new particle is found, it will significantly advance particle physics.*
   - *Revision for ILC250:*
     - *Research program: BSM searches through precision h&t. As for NP searches, no prospect has been obtained from the LHC Run II results. No precision top physics possible at 250 GeV.*
     - *Prospects: Size and pattern of deviations from SM, if any, will tell us the nature of BSM physics and its energy scale.*

# Major objections to the skeleton

- ***Prospects for new particle searches at 250 GeV seem unfairly underestimated.***
- ***If 500 GeV is not enough, why not increasing the energy instead of reducing it to 250 GeV?***
- ***Clearly state that the importance of precision Higgs coupling measurements has been enhanced by the LHC Run II results.***
- ***Is XFEL/FAIR section does not fit the WG report. The WG report should be about the physics case of ILC250.***
  ***→ There will be hearing on XFEL/FAIR in the 4th meeting.***
- ***The ILC250/500 comparison table is misleading; the importance of the Higgs coupling measurements is not properly reflected there.***

***The 4th Meeting of the Particle & Nuclear Physics WG will happen on***

***April 13, 2018***

***The 34d Meeting of the TDR Validation WG will happen on***

***March 22, 2018***

# *Benchmarks for physics-driven detector optimization*

Jenny created a new web page for benchmarks for physics-driven detector optimization:

https://confluence.desy.de/display/ILD/Benchmarks+for+physics-driven+detector+optimisation

Take a look for the benchmark processes and quantities