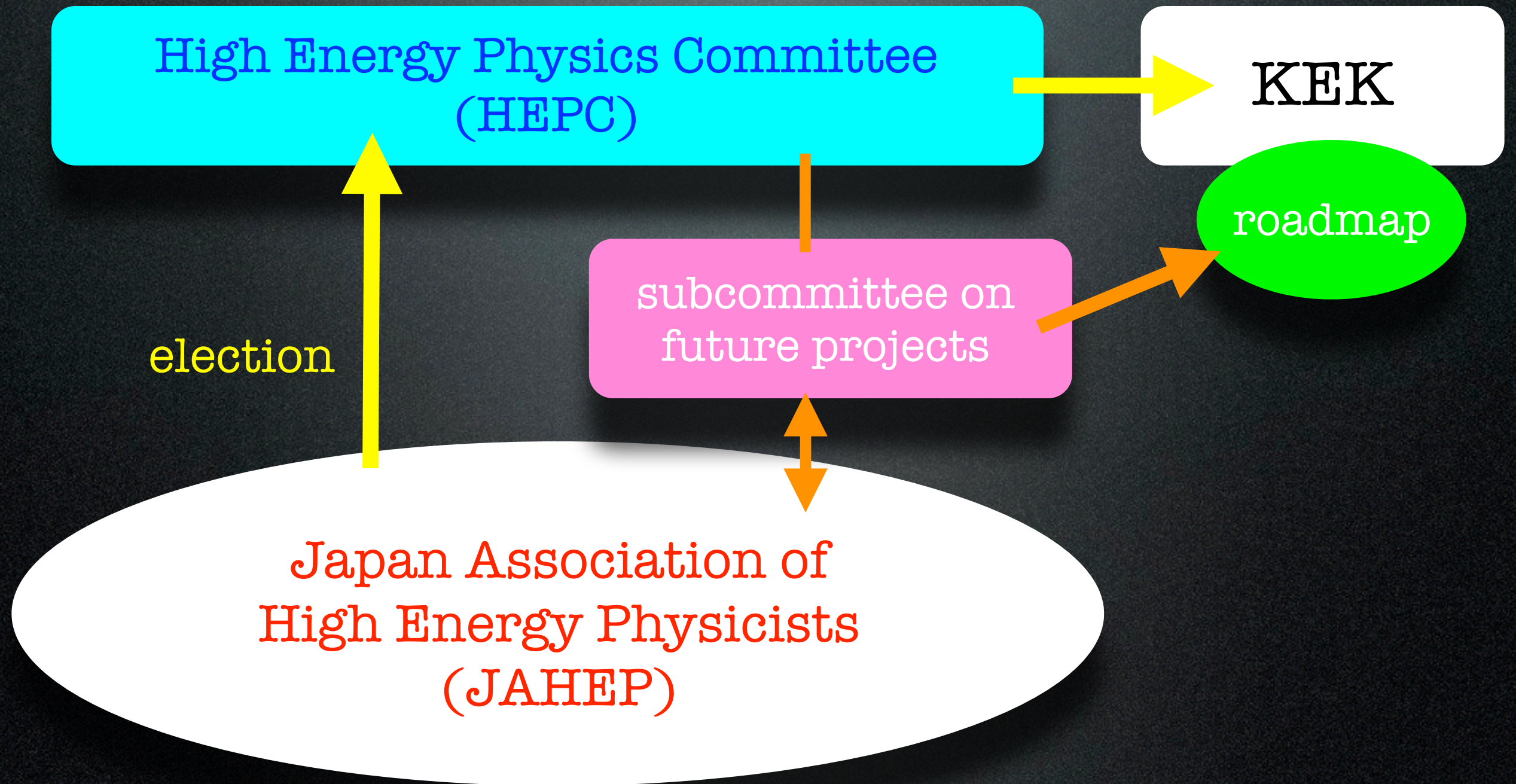


# Japan's Strategy for Future Projects

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The University of Tokyo



# High Energy Physics Community in Japan





# Subcommittee on Future Projects

- Appointed by HEPC after discussion at the general meeting of JAHEP in spring, 2009
- Charge:
  - Report on Japan's future projects in the time scale of more than 10 years into future
  - Based on physics importance; also consider global trends/prospects
  - Include non-accelerator experiments

<http://www.icepp.s.u-tokyo.ac.jp/hecsubc/>

(in Japanese)



# Committee members

- S. Asai/Tokyo, T. Iijima/Nagoya, K. Ishii/KEK,  
K. Inoue/Tohoku, Y. Ushiroda/KEK,  
Y. Ohnishi/KEK, J. Hisano/Nagoya,  
M. Kuriki/Hiroshima, T. Kobayashi/KEK,  
Y. Kubota/KEK, T. Nakaya/Kyoto, M. Nojiri/KEK,  
T. Nomura(secretary)/KEK, M. Hazumi/KEK,  
K. Hanagaki(secretary)/Osaka,  
H. Murayama/Tokyo-Berkeley,  
T. Mori(chair)/Tokyo, T. Moroi/Tokyo,  
S. Yamashita/Tokyo

(in “aiueo” order)



# Interim Recommendations (April 2011)

- after spending 1.5 years in reviewing the present/future projects
- starting point for community discussion
  - Potential discoveries foreseen in the next  $\sim 5$  years
  - Scenario strategies for future projects
  - Proposal to form a standing committee on future strategy for flexible & timely updates (instead of periodic updates) of strategies

The recommendations were ready in March  
but was delayed by the earthquake



# Road to Final Report

- 2011 4/19 Interim Recommendations
- 2011 6/25 general kick-off town meeting @Tokyo
- 2011 7/29 underground/astrophysics town meeting @Kashiwa
- 2011 8/09 J-PARC town meeting @Tokai
- 2011 9/10 collider town meeting @Nagoya
- 2011 9/17 general town meeting (JPS symposium) @Hirosaki
- 2012 2/11 Final Report submitted to HEPC
  - 2012 3/05 Final Report released to public
- 2012 3/25 Discussion at general meeting of JAHEP @Osaka
- 2012 3/26 Approved by HEPC

Interim recommendations essentially supported by community



# Final Report



# Recommendations

The committee makes the following recommendations concerning large-scale projects, which comprise the core of future high energy physics research in Japan.

## Large Projects

- Should a new particle such as a Higgs boson with a mass below approximately 1 TeV be confirmed at LHC, Japan should take the leadership role in an early realization of an  $e^+e^-$  linear collider. In particular, if the particle is light, experiments at low collision energy should be started at the earliest possible time. In parallel, continuous studies on new physics should be pursued for both LHC and the upgraded LHC version. Should the energy scale of new particles/physics be higher, accelerator R&D should be strengthened in order to realize the necessary collision energy.
- Should the neutrino mixing angle  $\theta_{13}$  be confirmed as large, Japan should aim to realize a large neutrino detector through international cooperation, accompanied by the necessary reinforcement of accelerator intensity, so allowing studies on CP symmetry through neutrino oscillations. This new large neutrino detector should have sufficient sensitivity to allow the search for proton decays, which would be direct evidence of Grand Unified Theories.

It is expected that the Committee on Future Projects, which includes the High Energy Physics Committee members as its core, should be able to swiftly and flexibly update the strategies for these key, large scale projects according to newly obtained knowledge from LHC and other sources.

## standing committee

It is important to complete and start the SuperKEKB including the detector, as scheduled. Some of the medium/small scale projects currently under consideration have the implicit potential to develop into important research fields in the future, such as neutrino physics and as such, should be promoted in parallel to pursue new physics in various directions. Flavour physics experiments such as muon experiments at J-PARC, searches for dark matter and neutrinoless double beta decays or observations of CMB E-mode polarization and dark energy are considered as projects that have such potential.

## medium/small-scale projects



# Large Projects (1)

- Should a new particle such as a Higgs boson with a mass below approximately 1 TeV be confirmed at LHC, Japan should take the leadership role in an early realization of an  $e^+e^-$  linear collider. In particular, if the particle is light, experiments at low collision energy should be started at the earliest possible time. In parallel, continuous studies on new physics should be pursued for both LHC and the upgraded LHC version. Should the energy scale of new particles/physics be higher, accelerator R&D should be strengthened in order to realize the necessary collision energy.



Discovery of light Higgs-like boson in July  
ILC Strategy Council formed for coherent strategy



# Large Projects (2)

- Should the neutrino mixing angle  $\theta_{13}$  be confirmed as large, Japan should aim to realize a large-scale neutrino detector through international cooperation, accompanied by the necessary reinforcement of accelerator intensity, so allowing studies on CP symmetry through neutrino oscillations. This new large-scale neutrino detector should have sufficient sensitivity to allow the search for proton decays, which would be direct evidence of Grand Unified Theories.



Large mixing angle  $\theta_{13}$  confirmed



# a standing committee

It is expected that the Committee on Future Projects, which includes the High Energy Physics Committee members as its core, should be able to swiftly and flexibly update the strategies for these key, large-scale projects according to newly obtained knowledge from LHC and other sources.



Committee on Future Projects started

The first meeting held in June

discussion on neutrino projects

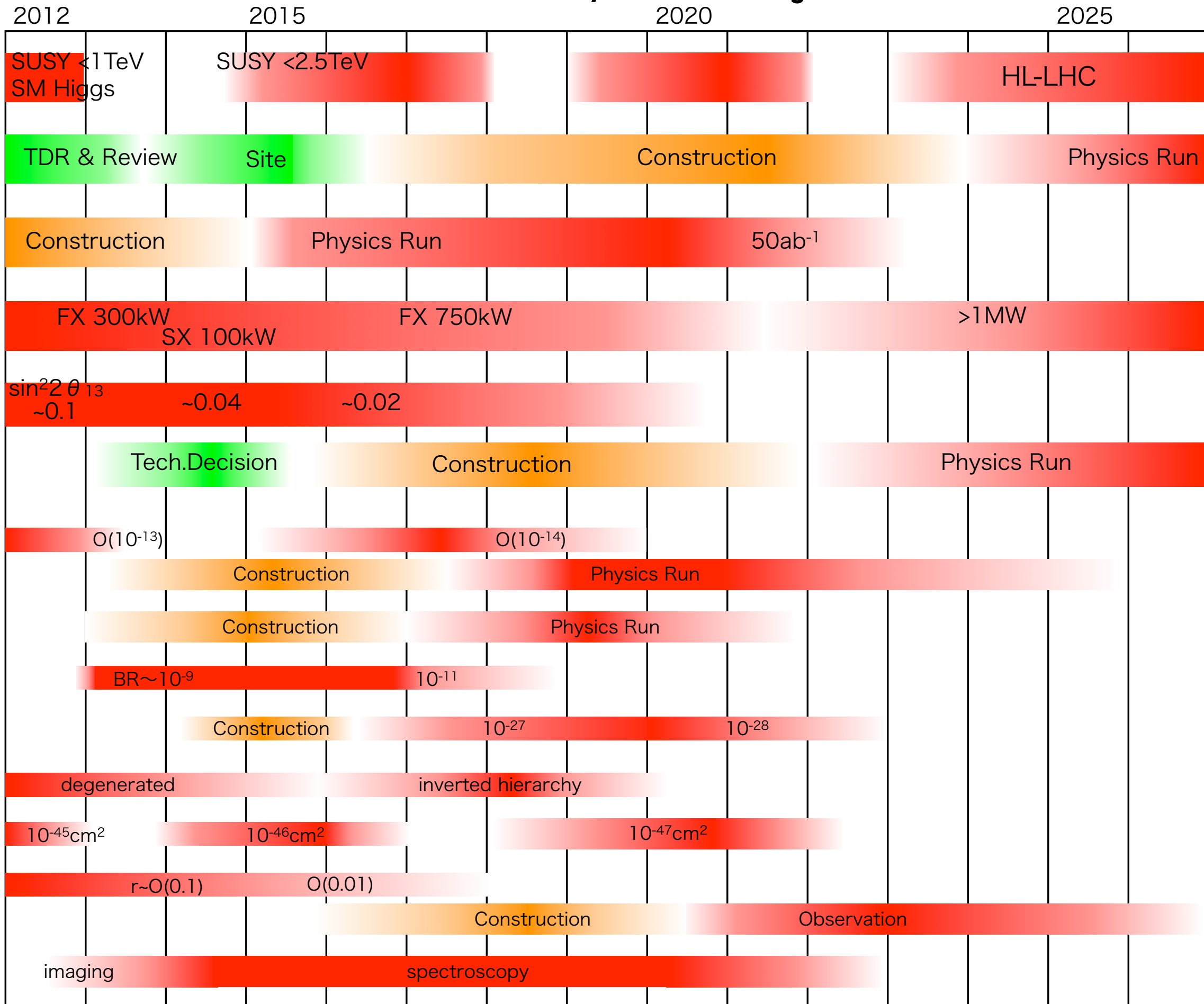


# other (medium/small) projects

It is important to complete and start the SuperKEKB including the detector, as scheduled. Some of the medium/small scale projects currently under consideration have the implicit potential to develop into important research fields in the future, such as neutrino physics and as such, should be promoted in parallel to pursue new physics in various directions. Flavour physics experiments such as muon experiments at J-PARC, searches for dark matter and neutrinoless double beta decays or observations of CMB B-mode polarization and dark energy are considered as projects that have such potential.



# Timelines of Current/Future Projects





Recommendations	4
1 Current Situation and Future Perspectives	6
1.1 Current Situation of Particle Physics	6
1.2 Future Perspectives of Particle Physics	7
2 Energy Frontier	10
2.1 Overview	10
2.2 International Linear Collider	10
2.3 LHC Upgrade	13
2.4 Other Projects	14
3 Neutrino Oscillation	16
3.1 Neutrino Oscillation and Proton Decay	16
3.2 Current Status	16
3.3 Future Planning	16
4 Flavour Physics	21
4.1 Super B-factories	21
4.2 Muon Physics	22
4.3 Kaon Experiments	23
4.4 Neutrons	23
5 Non-Accelerator Particle Physics Experiments	24
5.1 Underground Astroparticle Physics Experiments	24
5.2 Cosmological Observations	26
6 Human Resources and Development of Technology	28

full report  
~ 28 pages

English translation of the full report is available:  
[http://www.jahep.org/office/doc/201202\\_hecsupc\\_report.pdf](http://www.jahep.org/office/doc/201202_hecsupc_report.pdf)



# After the Recommendations

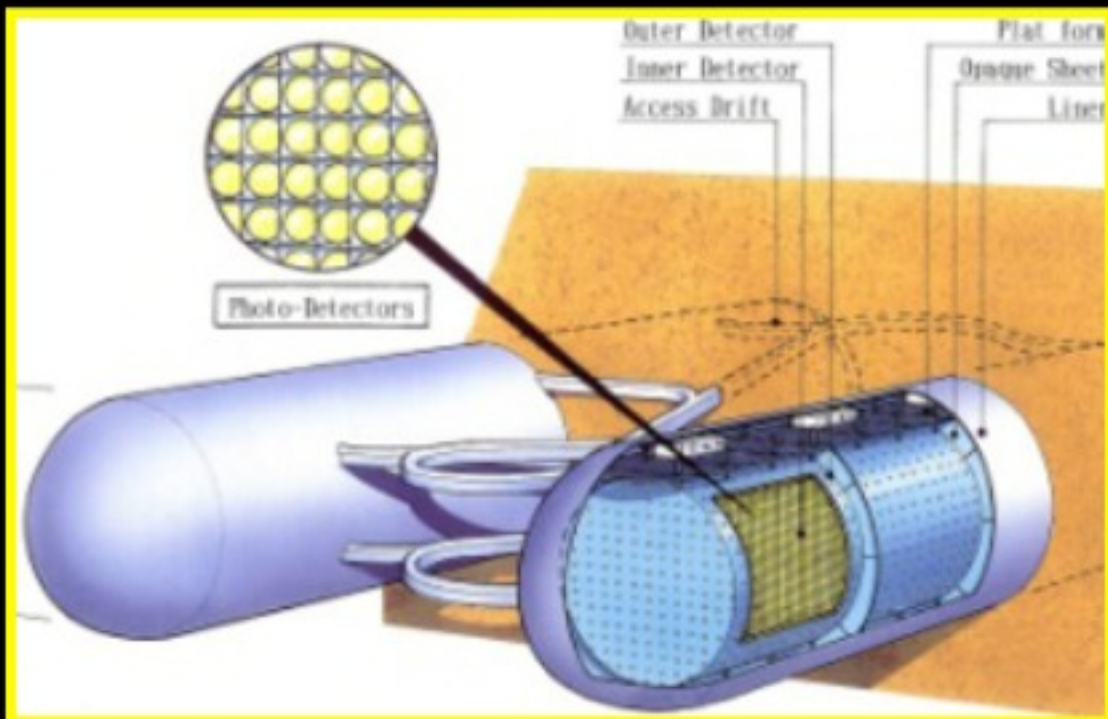
- “Committee on Future Projects” set up
  - First meeting in June
- “ILC Strategy Council” formed under HEPC
  - consistent LC strategies - 3 meetings since June
- the Report submitted to European Strategy at end of July
  - desirable to form consistent strategy of global HEP community
  - “Snowmass 2013” (CSS2013) next year
- Discussion on update of KEK roadmap going on



end

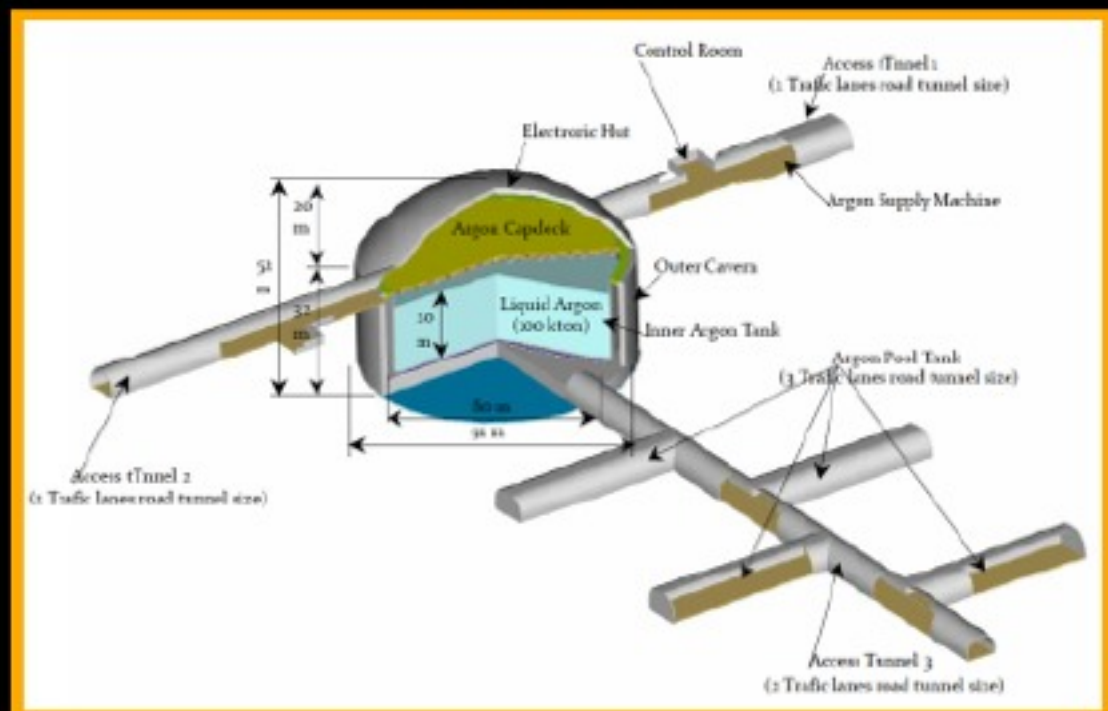


J-PARC+HK @ 神岡 L=295km OA=2.5deg



(Sep 2011) arXiv:1109.3262

J-PARC+LAr @ 隠岐 L=658km OA=0.78deg



P32 proposal (Lar TPC R&D)  
Recommended by J-PARC PAC  
(Jan 2010), arXiv:0804.2111

J-PARC

w/ 1.7MW





# large-scale neutrino detector

- studies on CP symmetry through neutrino oscillations by long baseline neutrino experiment
- water cherenkov vs. liquid argon TPC
- international cooperation - global prospects
- reinforcement/upgrade of accelerator toward  $\sim$ MW
- sufficient sensitivity for proton decays