

# KEK: High Energy Accelerator Research Organization

KEK: COE with multi-function, multi-purpose Accelerator facility

Electron / positron

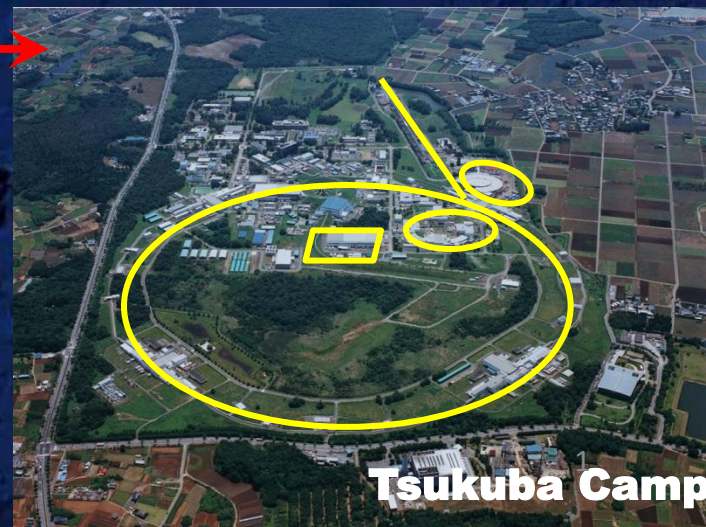


Light

Neutron, Muon,  
K mesons, Neutrinos



Tokai Campus



Tsukuba Camp

# High Energy Accelerator Research Org. (KEK)

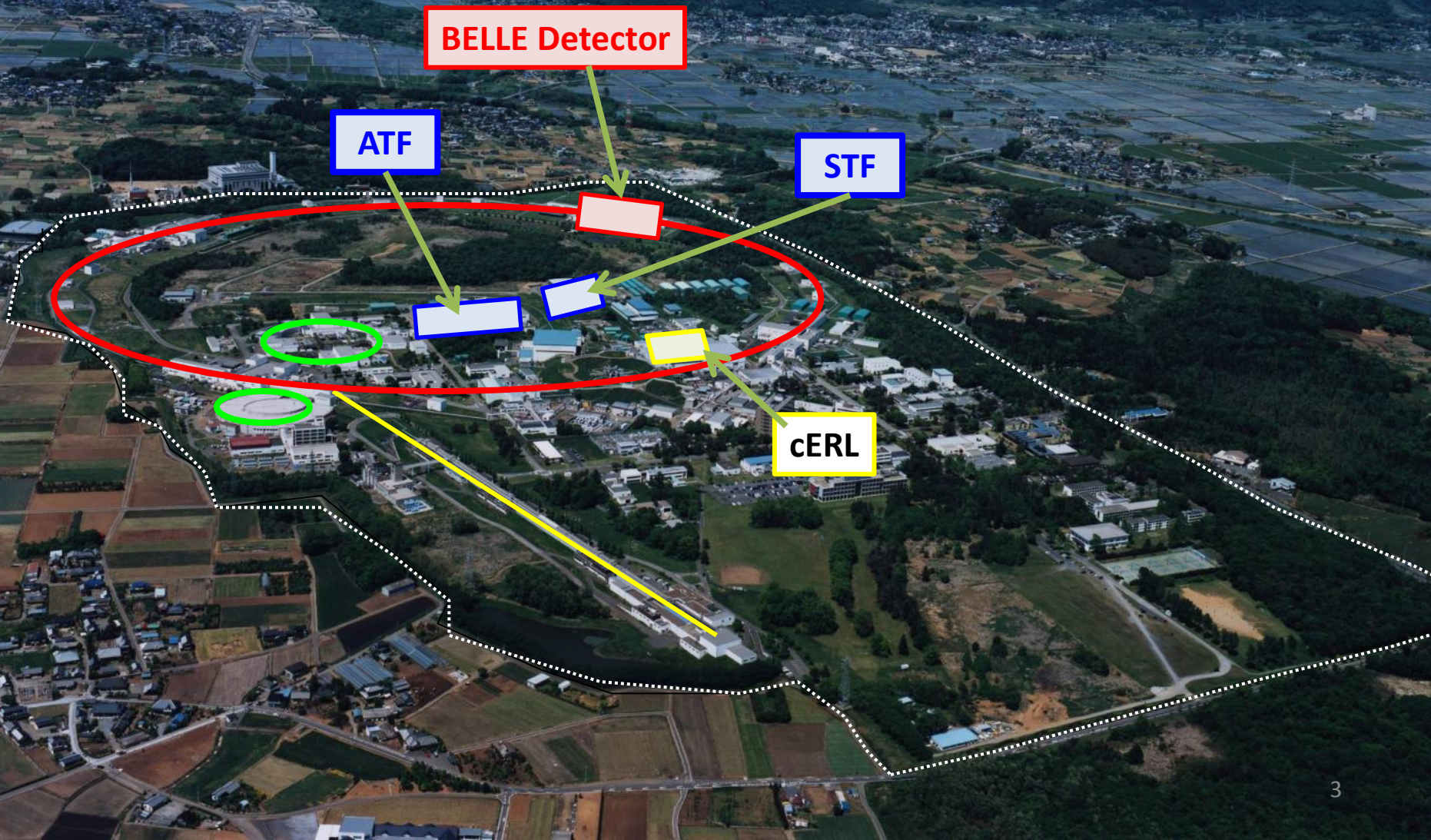
**KEKB (Electron-Positron Collider)**  
(Diam.  $\sim 1\text{km}$ ,  $e^-$  at  $8\text{GeV}$ ,  $e^+$  at  $3.5\text{GeV}$ )

**PF-AR**  
(Diam  $\sim 120\text{m}$ ,  $e^-$  at  $6.5\text{GeV}$ )

**Electron/Positron Linac**  
(Length  $\sim 400\text{m}$ ,  $e^-$  to  $8\text{GeV}$ ,  $e^+$  to  $3.5\text{GeV}$ )

**PF (Diam  $\sim 60\text{m}$ ,  $e^-$  at  $2.5\text{GeV}$ )**  
**Synchrotron  
Radiation Facility**

# High Energy Accelerator Research Org. (KEK)



**J-PARC**  
(by KEK-JAEA collab.)

Proton Linac

3 GeV  
Synchrotron



Neutrinos  
(to Kamioka)

MLF – Materials Life-  
Science Facility  
(Neutrons, Muons)

50 GeV Synchrotron

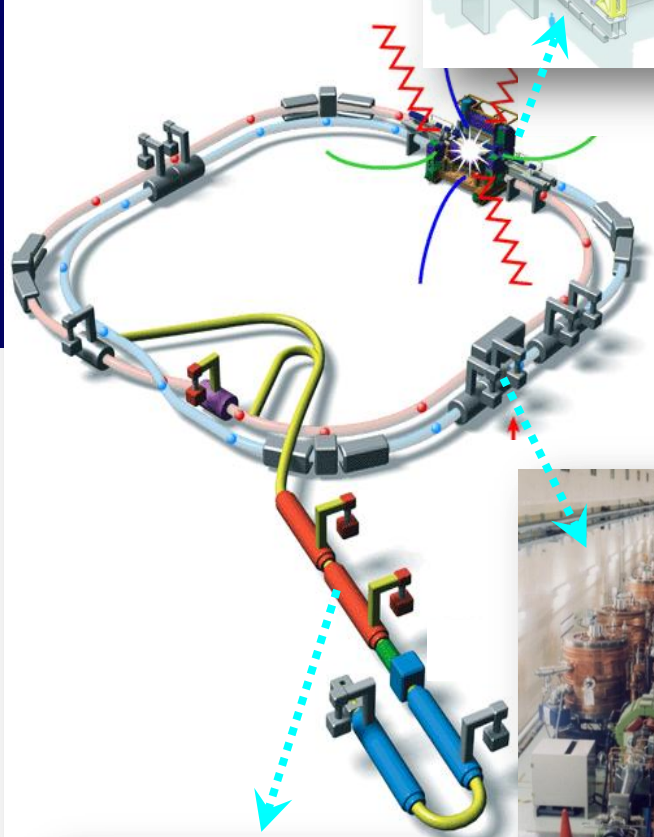
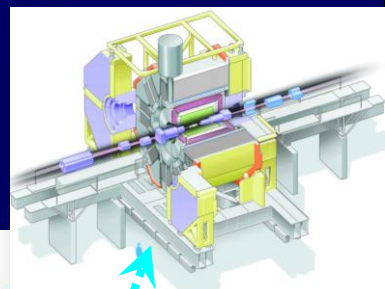
Hadron Hall





$e^-/e^+$  Collider  
KEKB  $\rightarrow$  SuperKEKB

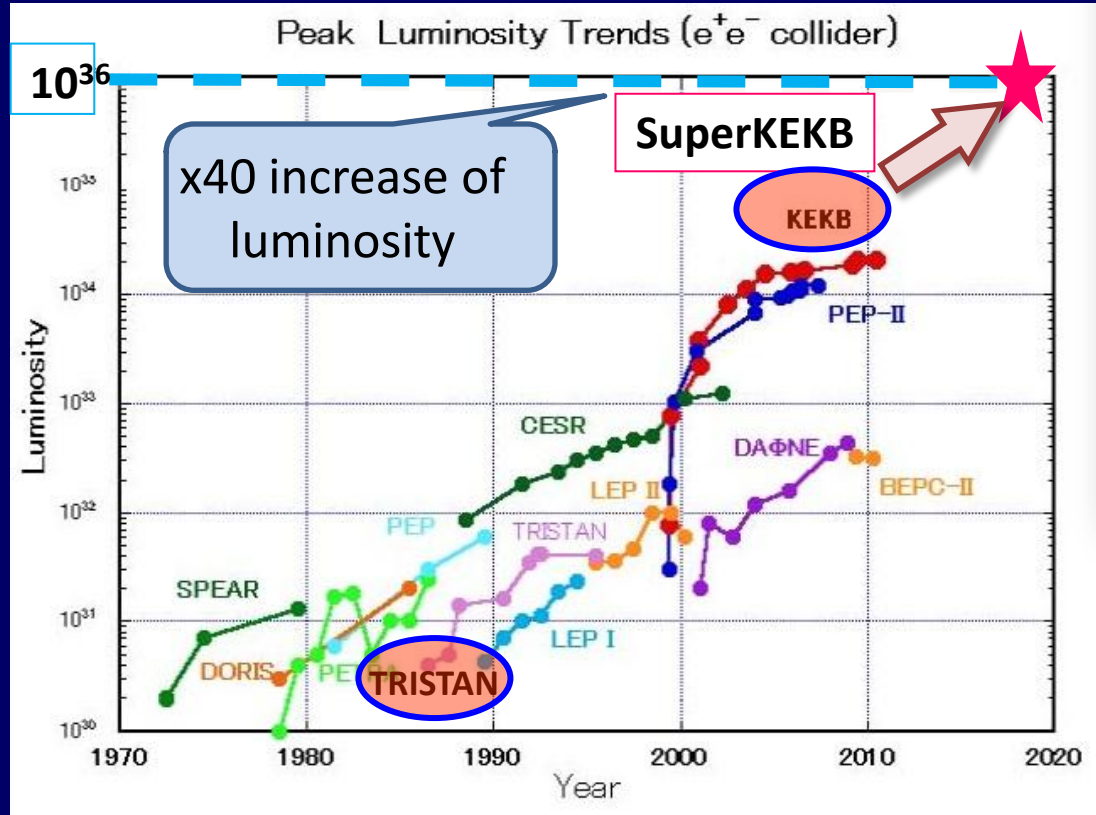
Belle Detector



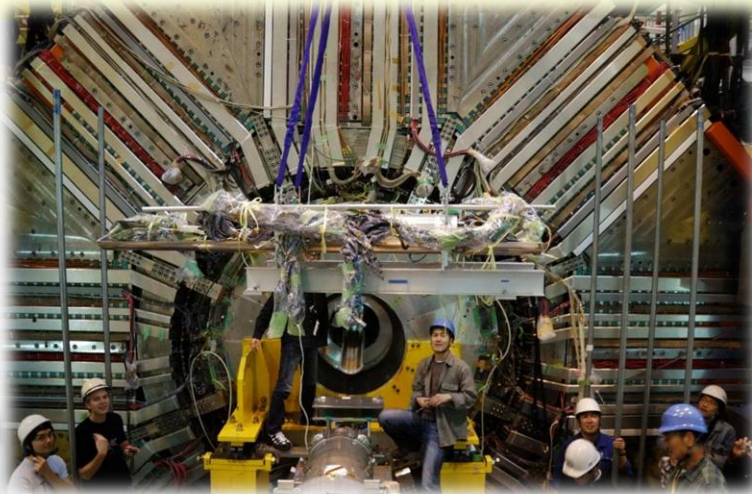
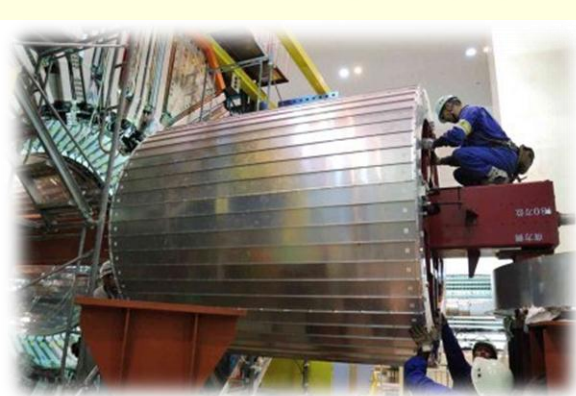
Ring RF



Linac

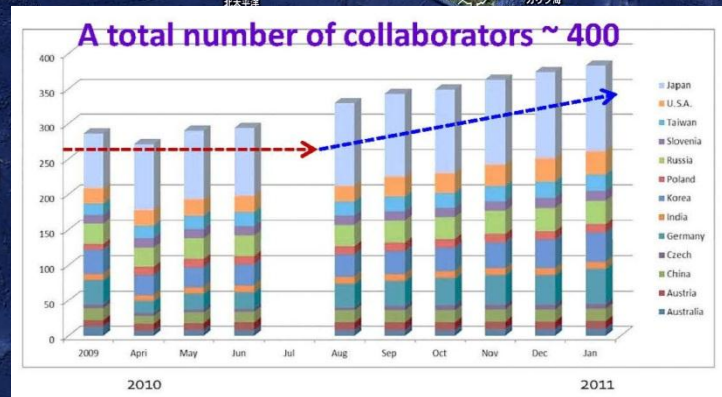
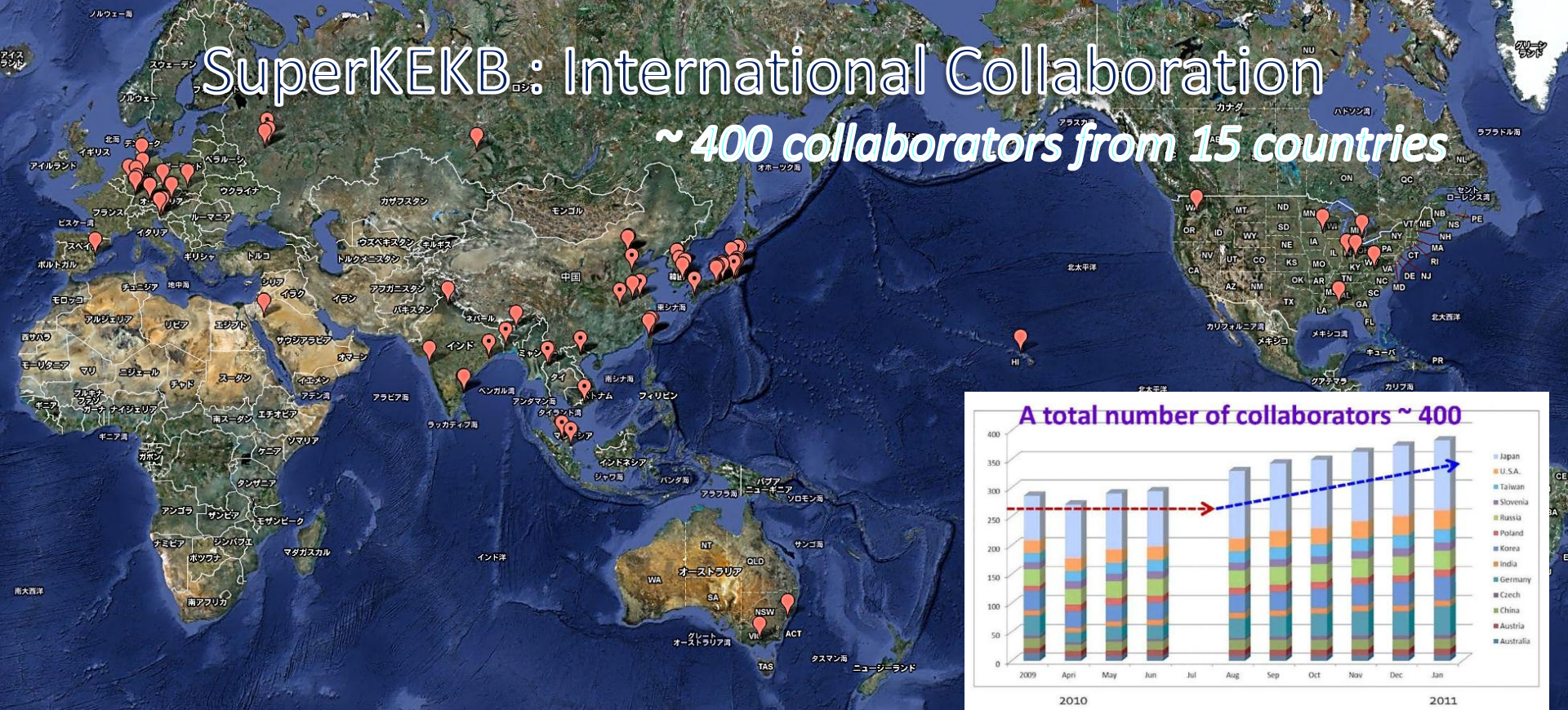


• KEKB operation finished at 9:00 am June 30, 2010



# SuperKEKB: International Collaboration

~ 400 collaborators from 15 countries



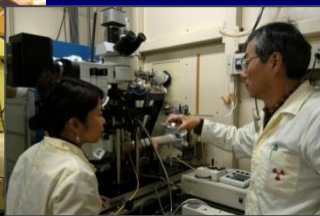
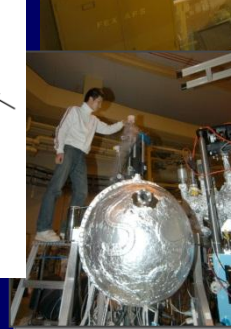
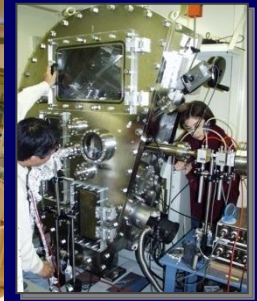
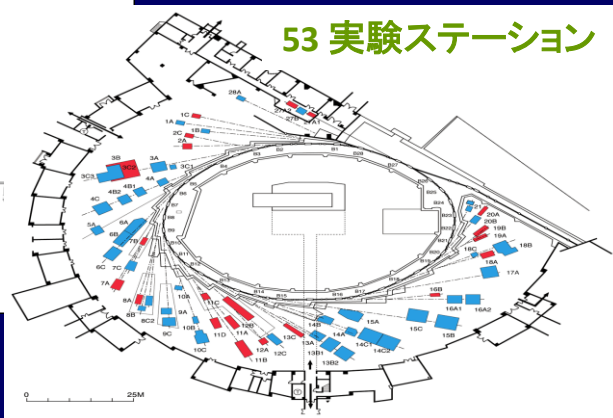
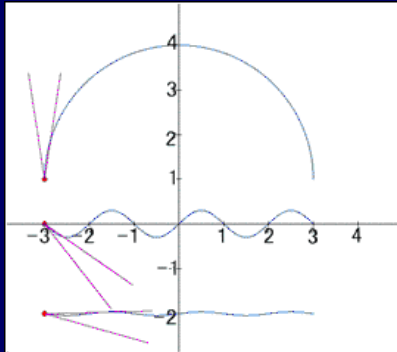
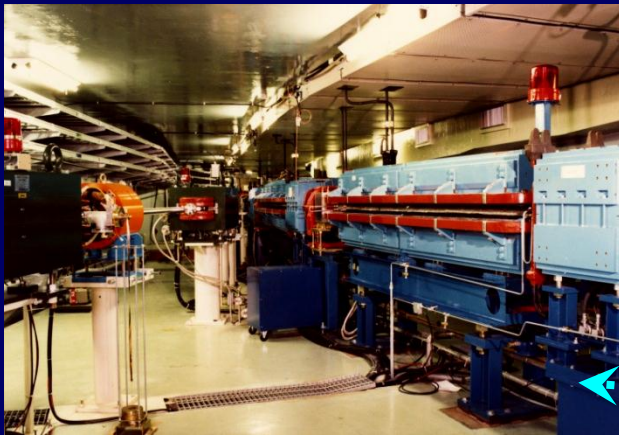
## SuperKEKB Groundbreaking Ceremony



18/Nov/2011



# Photon factory

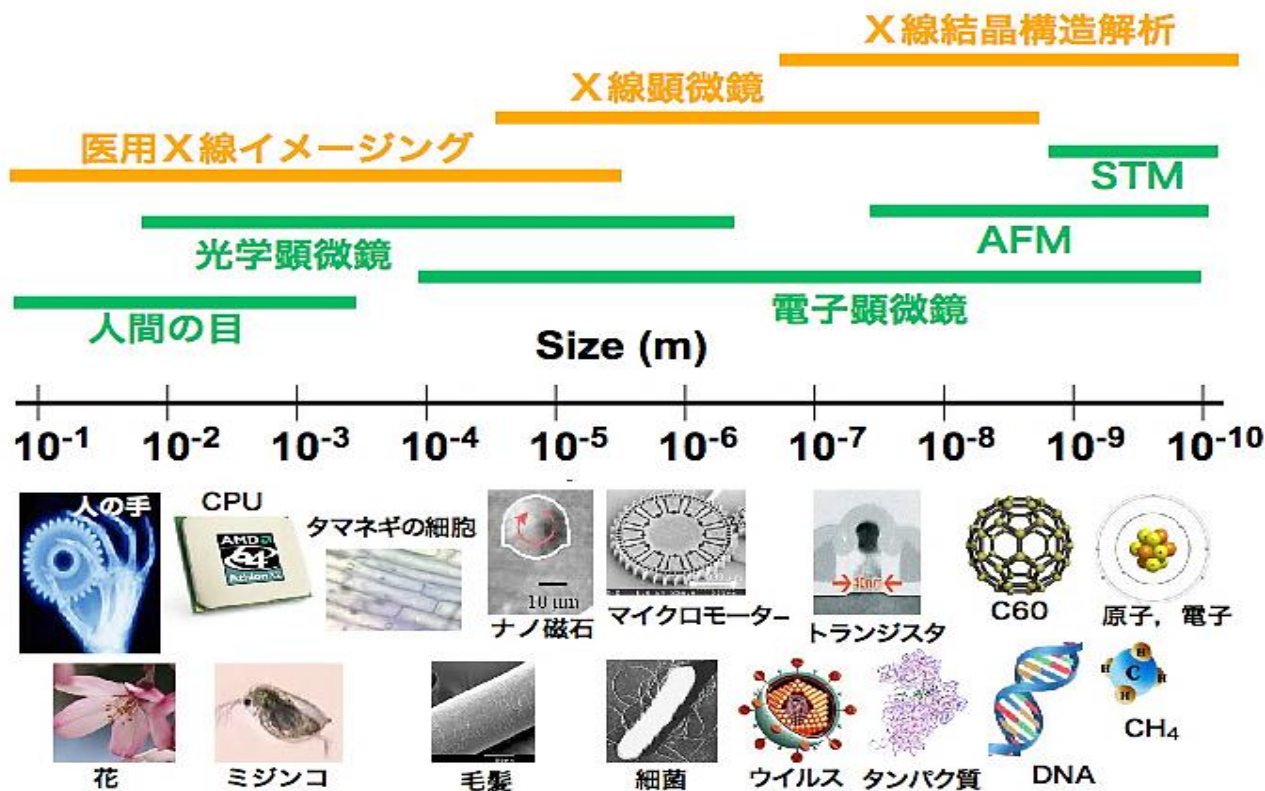
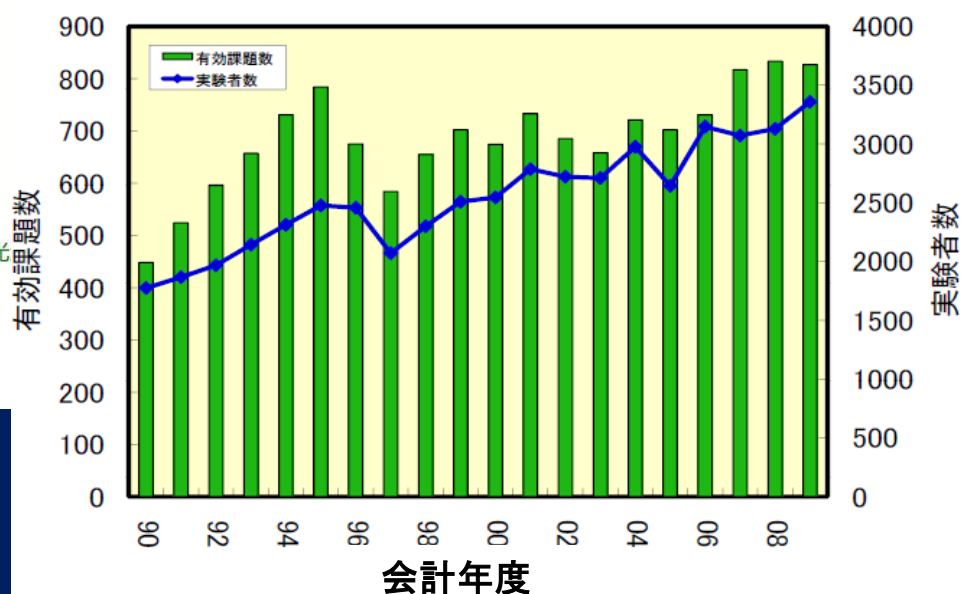




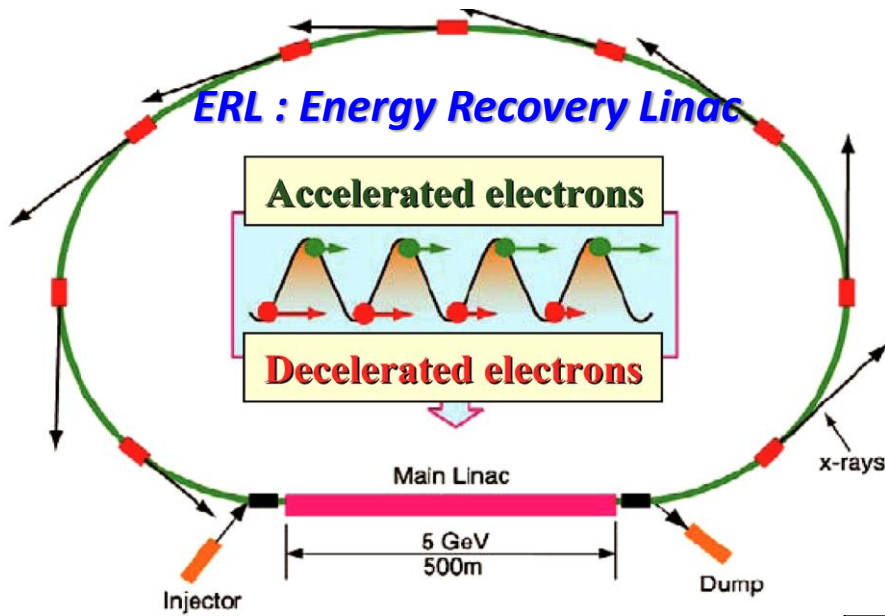
# 放射光による物質・生命科学研究

フォトンファクトリー（光の工場）の愛称で知られる放射光科学研究施設では、光させる高輝度放射光で、物質や生命の原子レベルの姿を捉えています。

Atoms, Molecules, Nano-materials, Life sciences, Earth sciences, Environment, Medicine...



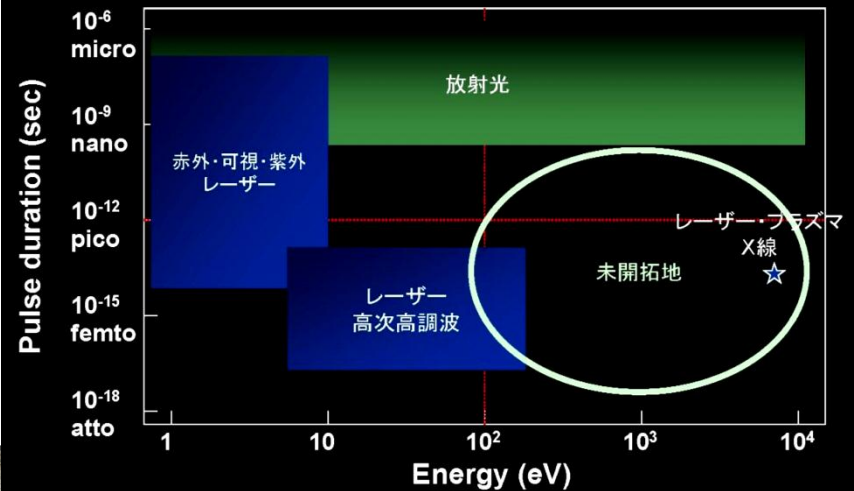
# Energy Recovery Linac (Future Project Proposal)



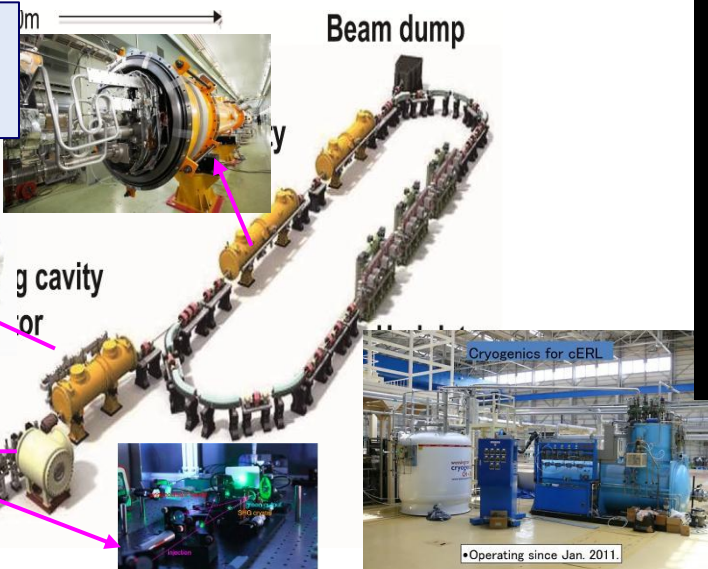
Required for next-generation light sources

- 1) sub-ps pulse:  $1/100 \sim 1/1000$  shorter than 3<sup>rd</sup>-SR
- 2) coherent X-rays: coherence > 20 % ( $\times 100 \sim 1000$  of 3<sup>rd</sup>-SR)
- 3) non-destructive meas: complementarity wrt SASE-FEL
- 4) high repetition (1.3 GHz): High-prec. + non-destr.
- 4) #Exp stations: 30~50 (Support wide range of expts)

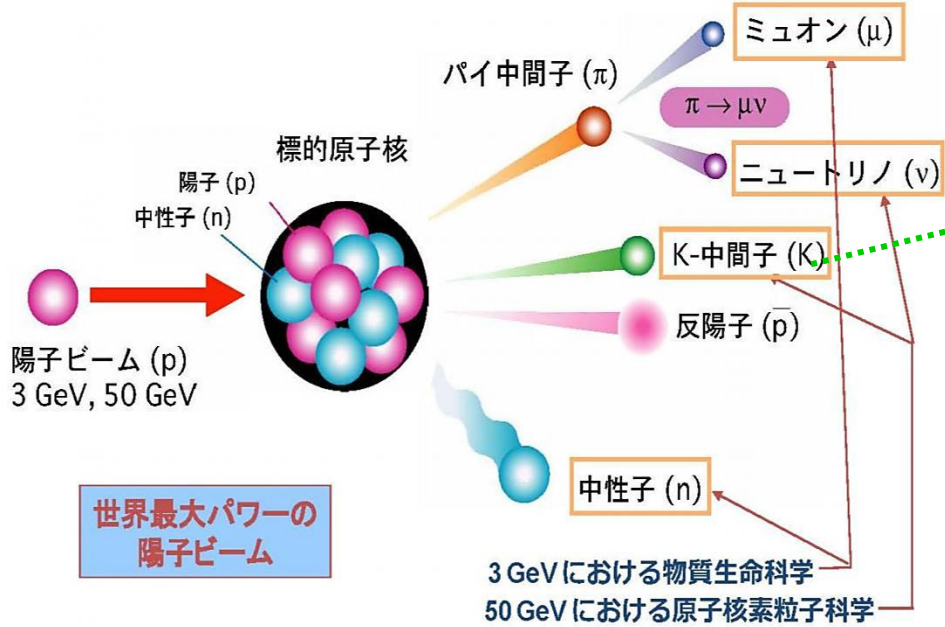
## 光源のエネルギーとパルス幅



Compact ERL  
Precursor proj







### ハドロン実験施設

K中間子の稀崩壊

$\Theta^+$  via  $p(\pi^-, K^-)$  reaction  
ペンタクォーク  $\Theta^+$

高分解能ハイパー原子核分光

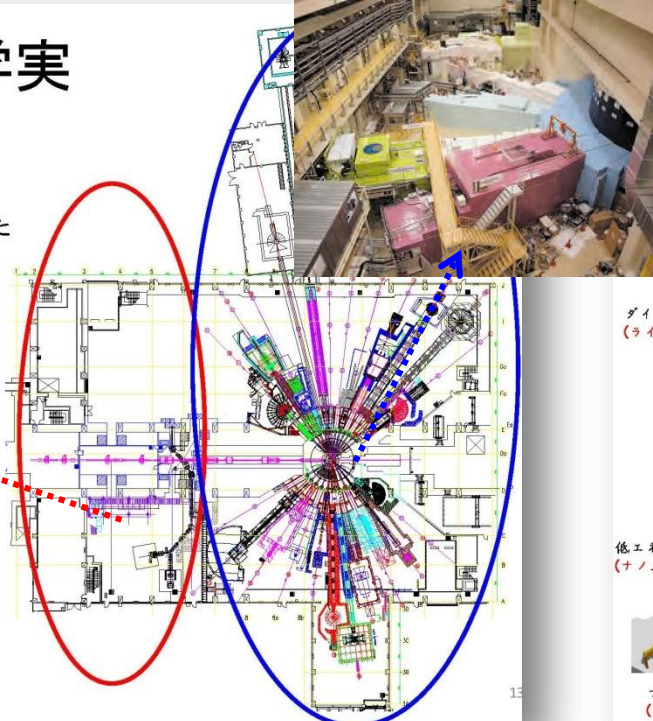
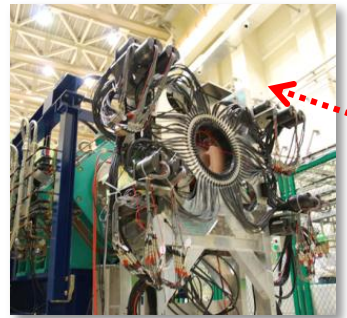
ストレンジクォーク核物質

kaonic nuclei via stopped K<sup>-</sup>

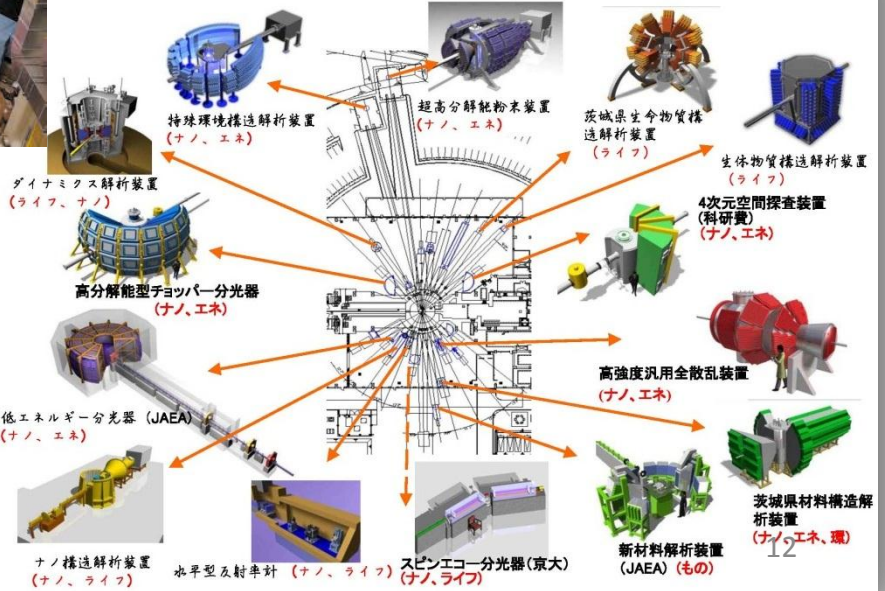
Reverse Violation Experiment with Kaons

## 物質生命科学実験施設

～機能発現メカニズムの探究  
放射光、中性子、ミュオンを用いた  
総合物質構造科学の推進  
～学際科学創成  
中性子、ミュオンの基礎物理学

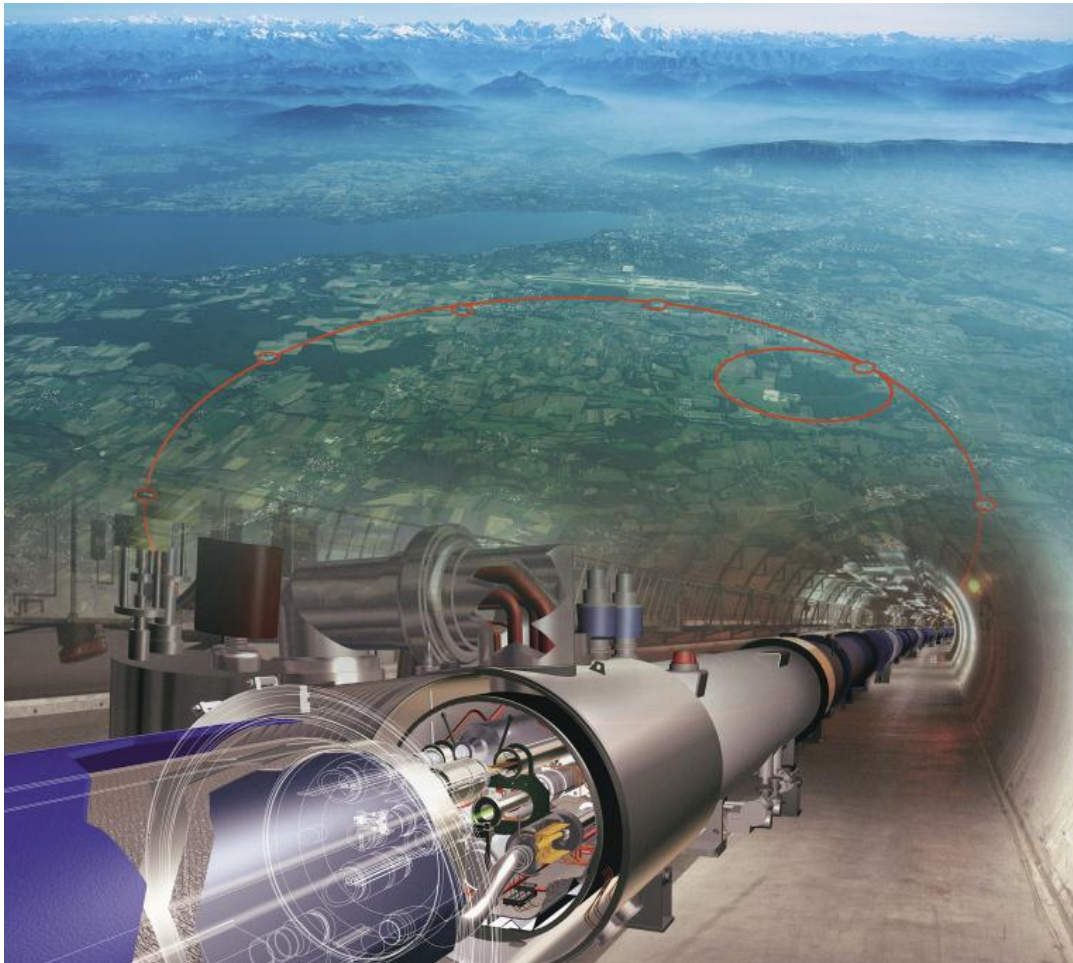
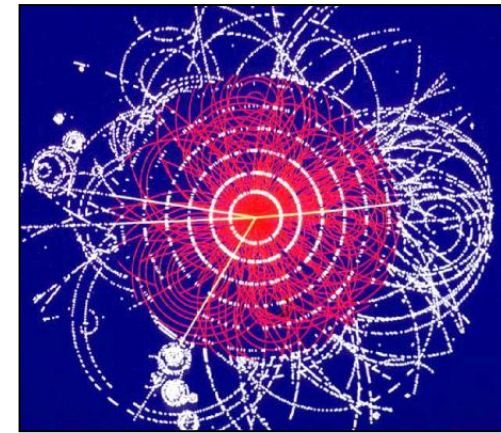
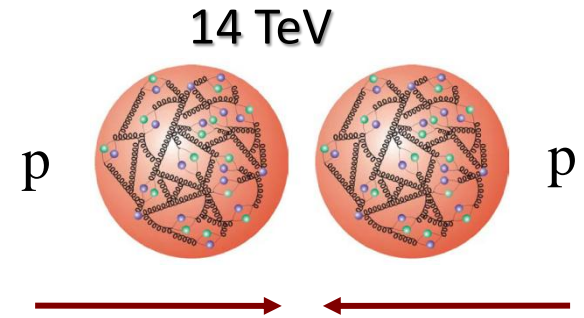


ナノテク・材料分野：ナノ エネルギー分野：エネ  
ものづくり技術分野：もの 環境分野：環

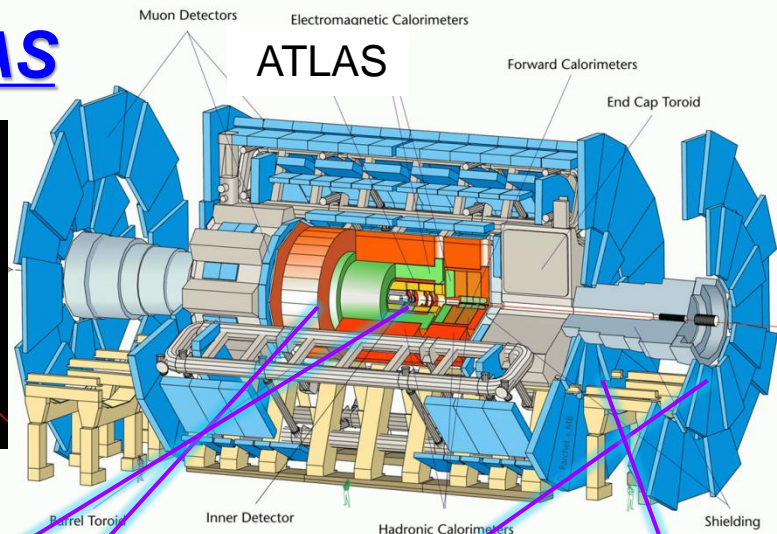
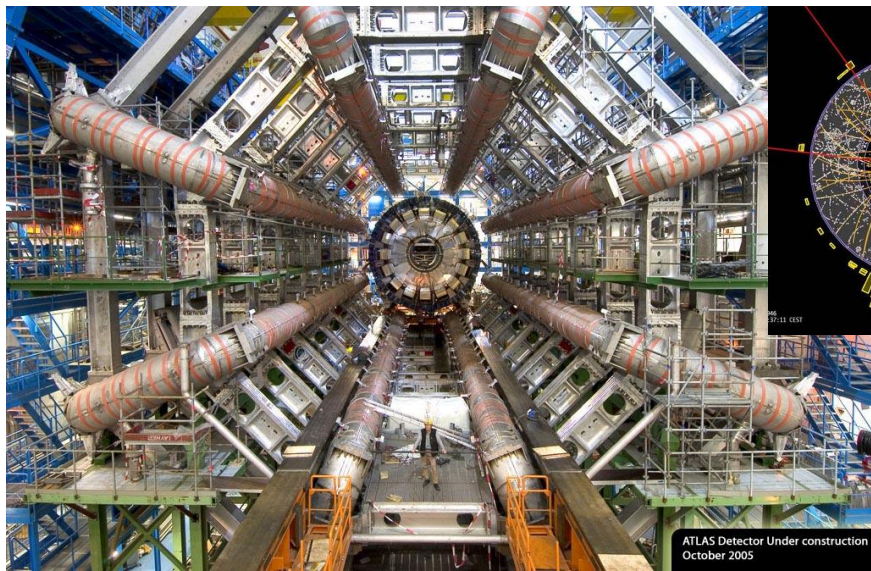


# Energy Frontier

- Participation in LHC Exp and Accelerator construction at CERN

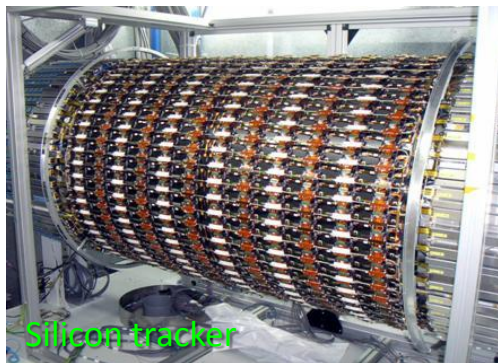


# LHC Japanese Presence at ATLAS



**Main solenoid magnet**

**980 modules for  
Silicon detector**

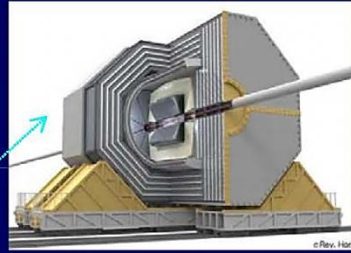
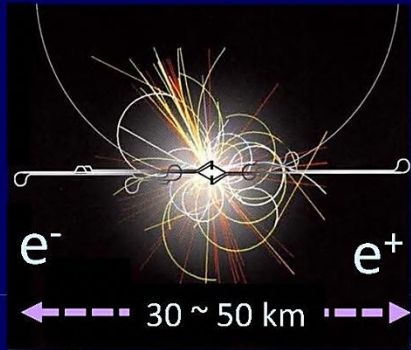


Silicon tracker

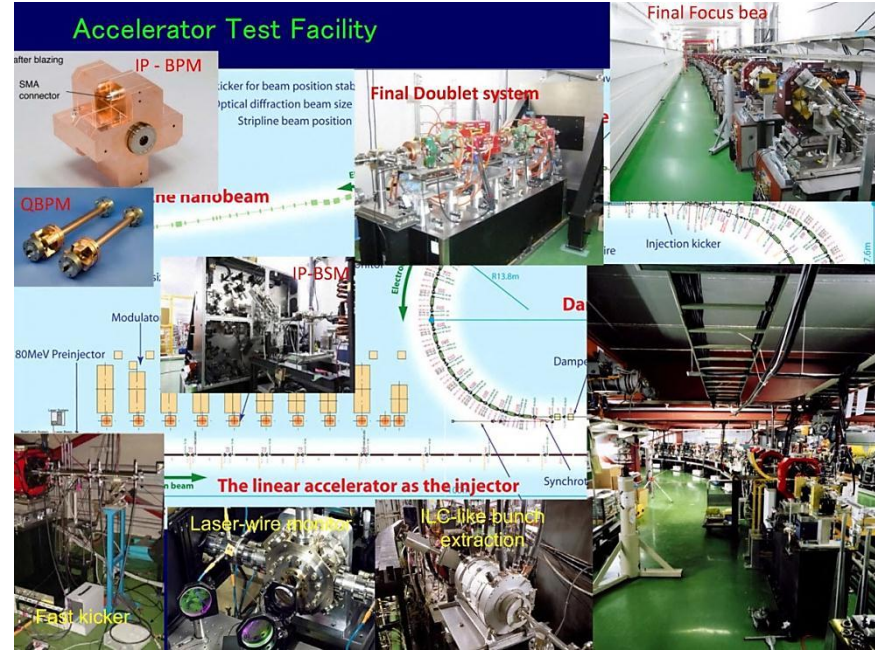
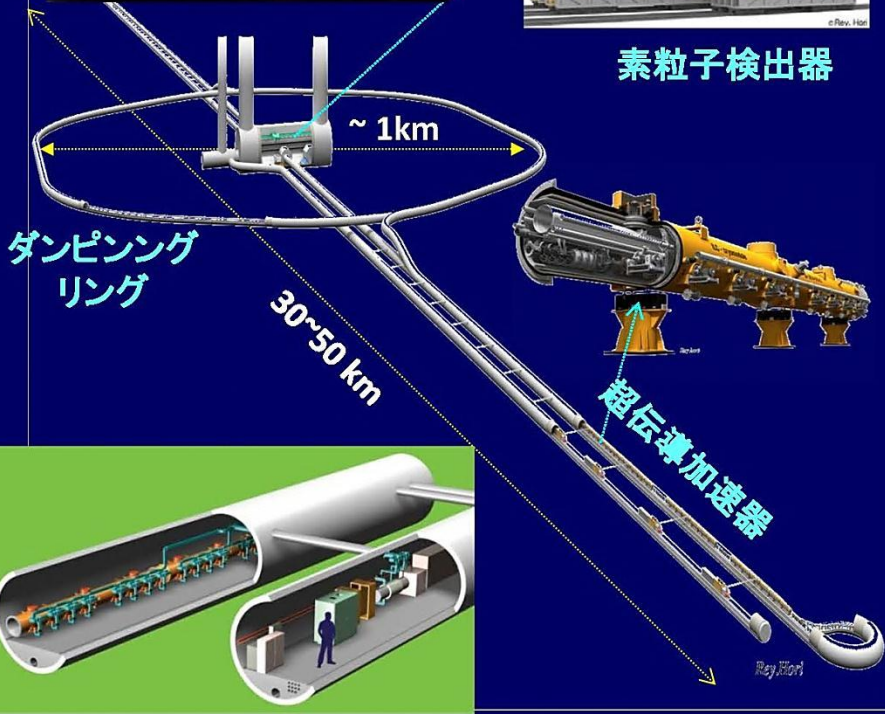


**Muon detector**

# Deesire for ILC



素粒子検出器

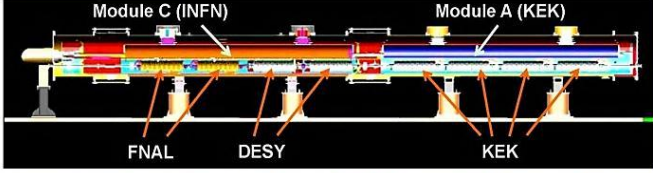


## International Linear Collider

### The first step of ILC

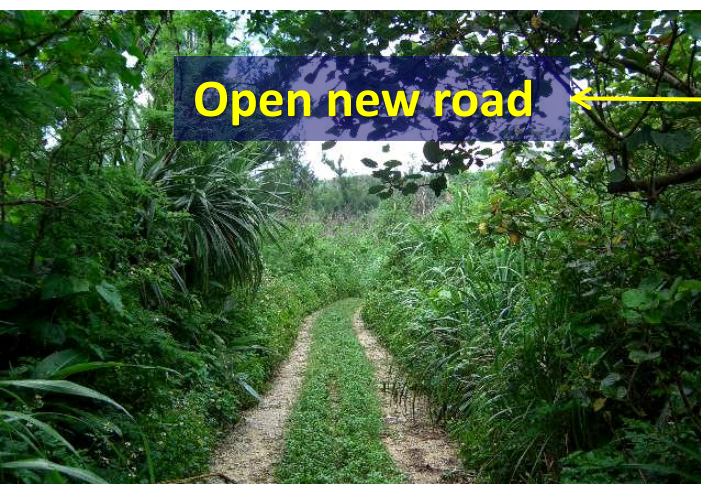
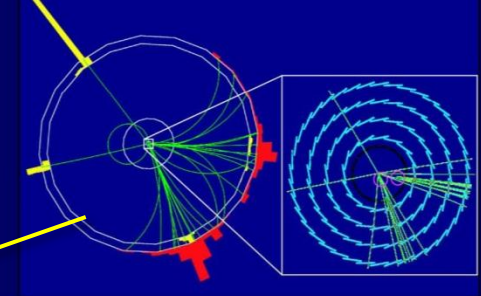
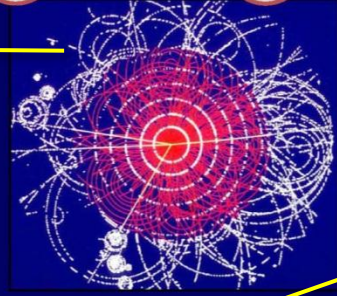
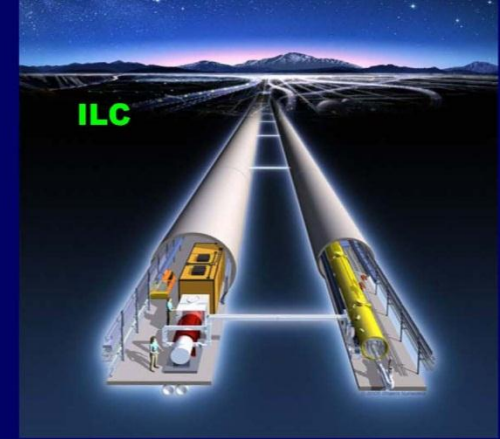
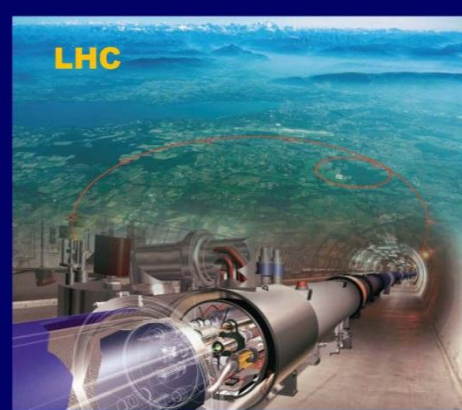
S1-Global

2009 ~ 2011.2.25

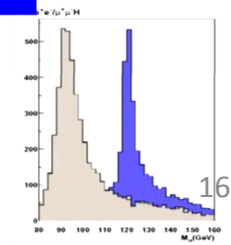
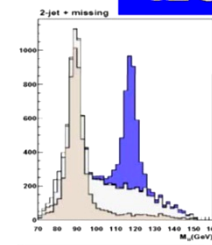
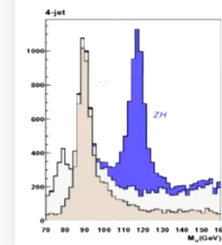
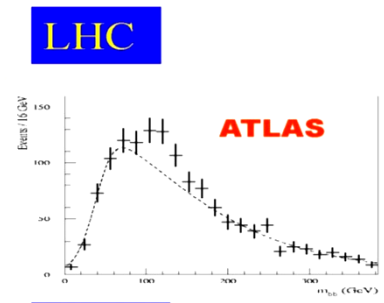
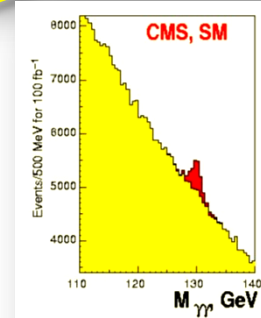


# Why ILC?

Protons, then Electrons

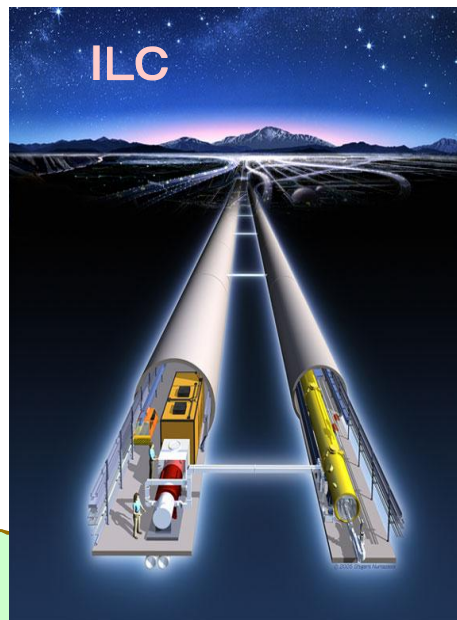


Detection of Higgs candidate





# Frontier Machines in the World



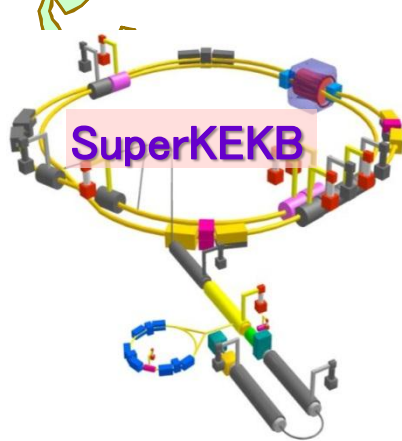
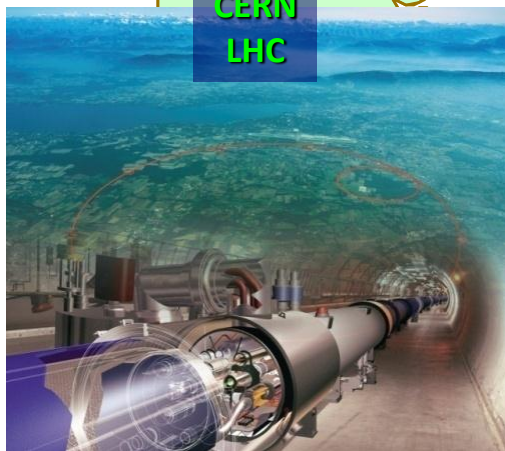
**FNAL**  
Tevatron

**CERN**

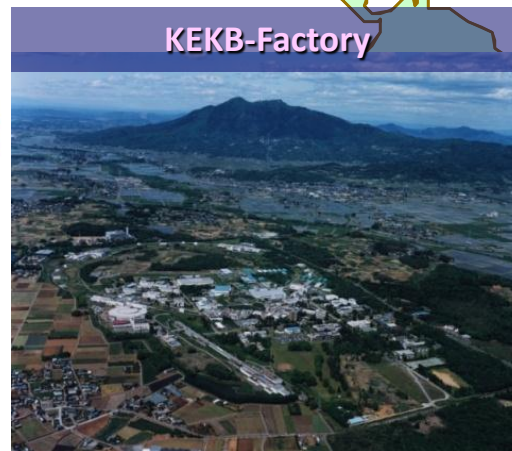
**KEK**

**FNAL**

**CERN**  
LHC



**KEKB-Factory**



# KEK quick statistics

- Staff count:
  - 690 = 370 (sci) + 160 (eng) + 160 (admin)
- Visiting scientists
  - 80,000 human-days (JFY2011)
- Experiments count:
  - PF: ~780 approved and running
  - J-PARC: ~40 approved and running
- Budget:
  - ~ 300 Oku-Yen ~ 375 M\$ / JFY2012

# KEK Publication Statistics

|      | Pubs with KEK numbers issued by the library |                     |            |              |                 |              |     | Pubs with may not have KEK numbers |         |
|------|---|---------------------|------------|--------------|-----------------|--------------|-----|------------------------------------|---------|
| Year | Annual Report                               | KEK Progress Report | KEK Report | KEK Internal | KEK Proceedings | KEK Preprint | Sum | Scopus data                        | (ArXiv) |
| 2002 | 1   | 3                   | 16         | 15           | 29              | 143          | 206 |                                    |         |
| 2003 | 1   | 8                   | 12         | 17           | 19              | 142          | 199 |                                    |         |
| 2004 | 1   | 7                   | 7          | 12           | 17              | 107          | 151 |                                    |         |
| 2005 | 1   | 6                   | 13         | 8            | 21              | 110          | 159 | 1082                               | (13)    |
| 2006 | 1   | 5                   | 4          | 15           | 18              | 80           | 123 | 1141                               | (13)    |
| 2007 | 1   | 5                   | 7          | 7            | 18              | 84           | 122 | 1107                               | (17)    |
| 2008 | 1   | 5                   | 9          | 8            | 20              | 57           | 100 | 973                                | (9)     |
| 2009 | 1   | 5                   | 10         | 5            | 13              | 42           | 76  | 1050                               | (8)     |
| 2010 | 1   | 5                   | 2          | 8            | 13              | 54           | 83  | 1065                               | (6)     |
| 2011 | 1   | 10                  | 8          | 13           | 7               | 33           | 72  | 982                                | (17)    |
| 2012 |   |                     |            |              |                 |              |     | 562                                | (16)    |

# KEK Issues

- Challenges ahead
  - More public outreach, with publication support being part of it
  - KEK lab repository / scientific output database for public viewing (???)
- Diversity of scientific programs
  - HEP + accelerators, Radiation physics, Nuclear, Materials, Life, Computer sciences
  - Different cultures
- Resource limitation
  - Need for being selective
- AAHEP6
  - Excellent forum for us to learn actions taken in the world.