2017 Joint workshop of the France-Korea (FKPPL) and
France-Japan (TYL/FJPPL) Particle Physics Laboratories
10-12 mai 2017, IPHC Strasbourg (France)

Report on the Brainstorming discussion

for future directions, priorities & collaboration on

theory/phenomenology/physics analysis

Bum-Hoon Lee
Sogang University, Seoul, Korea

May 12, 2017

Conveners:

Ryuichiro KITANO (KEK,Japan)
Bum-Hoon LEE (Sogang U. , Korea)

Formats :

three Presentations (5 minutes each)

Prof. Pyungwon KO,
Prof. Satoru YAMASHITA,
Dr. Marc BESANCON,

Three Panelists

Prof. Francois LE DIBERDER,
Prof. Yasuhiro OKADA,
Prof. Fumihiko SUEKANE

Floor Discussion

Session Participants

three Presentations

Pyungwon Ko (KIAS, Korea)

Satoru YAMASHITA
(ICEPP, Univ. of Tokyo, Japan)

Marc BESANCON
(CEA-Saclay/DRF/Irfu)

(slides with courtesy of speakers)

Korean activities

- Flavor physics and CP violation : quark & leptons, especially neutrinos (and connection with colliders)
- QCD : NRQCD, SCET, ChPT, etc.
- BSM : SUSY, extra dim, composite models, etc.
- Axion physics
- DM physics : (non)SUSY, Higgs portal, SIMP, etc.

Some Thoughts

- Appraisal of local gauge symmetry : well tested in the SM, and could be relevant to DM physics

- Scale symmetry to understand the origin of mass (?)

- Pure gauge singlet (?)

- Why is there no higher dim representation of gauge group for matter fields ?

- Why no scalars found other than H?

And, of course, a lot of more questions!

Near Future

• Test SM as many ways as possible : measurements of Higgs self couplings, Yukawa couplings, etc.

• Dark Matter : Cover the WIMP parameter space from LHC, DM (in)direct detection as much as possible

• New particles around EW scale accessible at the LHC ? (SUSY, extra dim, new scalars/fermions/vectors, etc.)

• Connection between particle physics & cosmology (collider vs. gravitational wave, for example)

Far Future

- Complete understanding of neutrinos

(Majorana vs. Dirac, CP phase, mass ordering, sterile neutrino, etc.)

- New energy scale, if nothing is found at the HL LHC ?

- Axion/axion-like particle search

- DE, DR, DM interactions (data vs. theory) ?

Presentation by

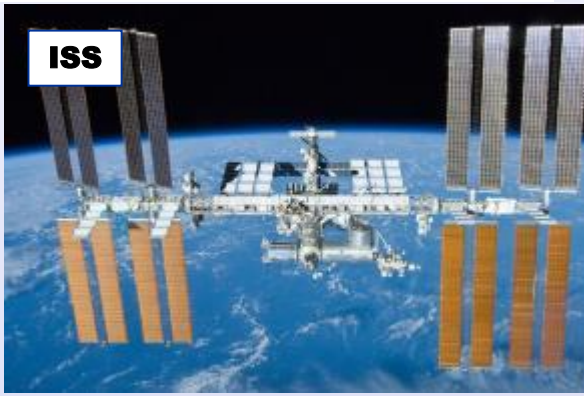
Pyungwon Ko (KIAS, Korea)

Satoru YAMASHITA
(ICEPP, Univ. of Tokyo, Japan)

International Linear Collider
– Physics and Recent Situation–

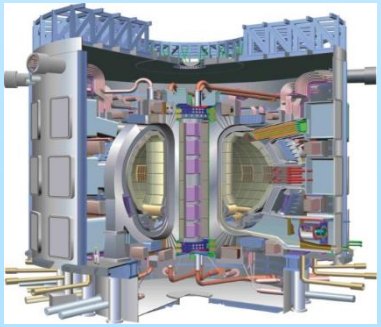
Marc BESANCON
(CEA-Saclay/DRF/Irfu)

International Big Science & Technology Projects
Hosted by USA, Europe and Asia(Japan etc)



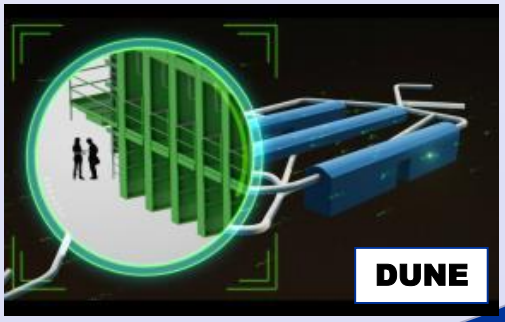
USA

ITER

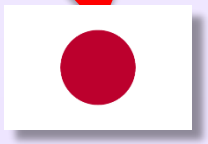


Europe

Mutual Cooperation



Japan



KAMIOKANDE

SuperKEKB

Energy Reach and Research Target

Research Target	Energy Needed	Linear (ILC)		Circular (China)
		Stage	Length	
Higgs Boson	250 GeV (Giga-electron-Volt)	1	20 km	50~70 km
Top Quark	350 GeV	2	23 km	100 km
Double Higgs Production	500 GeV	3	30 km	Not feasible
The Unknown	1,000 – 3,000 GeV	4	50 km	Not feasible

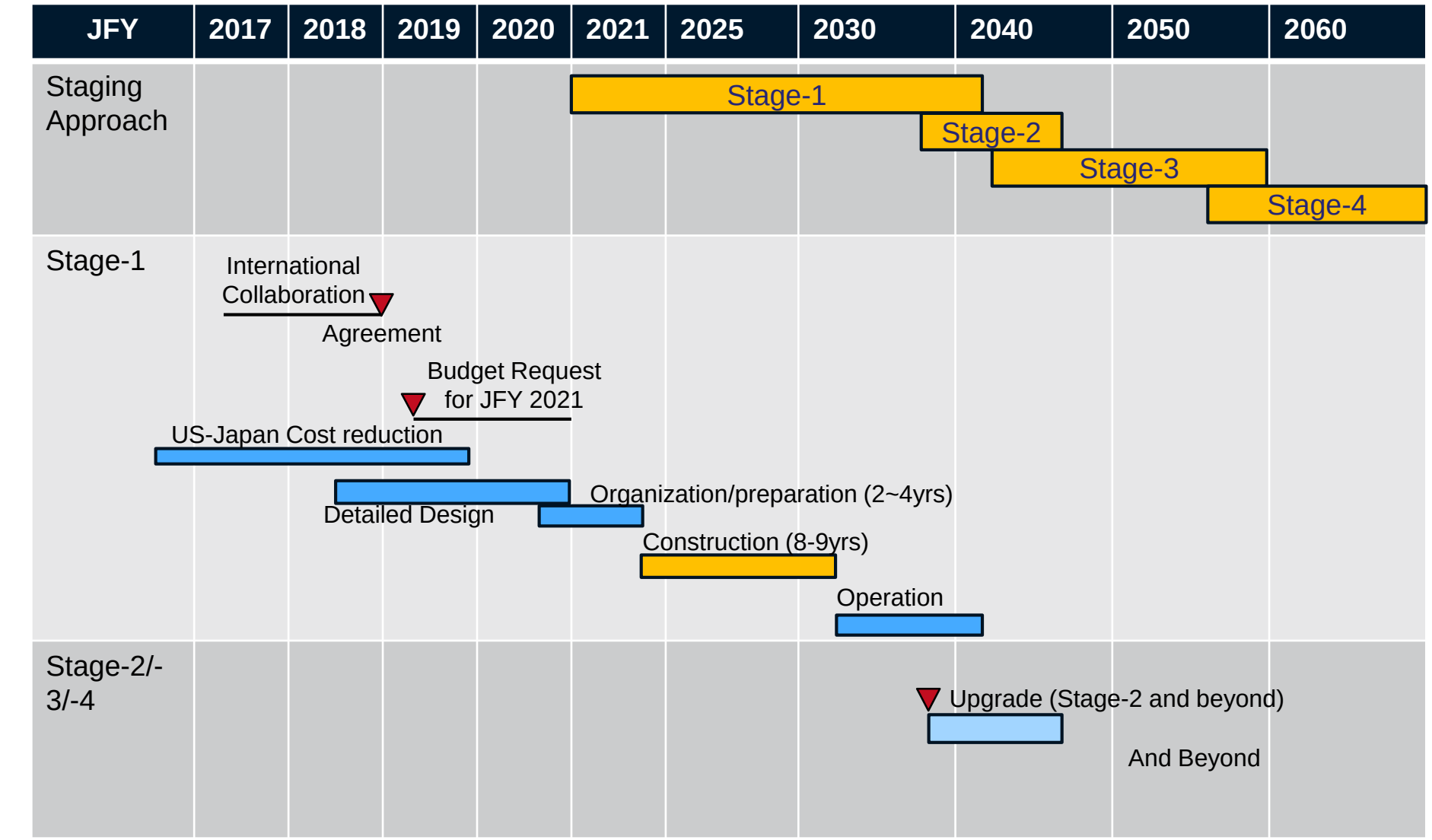
- Energy needed for producing **Dark Matter** is not known.
- It could be discovered at the 20 km or may require higher energy.
- If discovered, focus research at that energy.

Physics Target

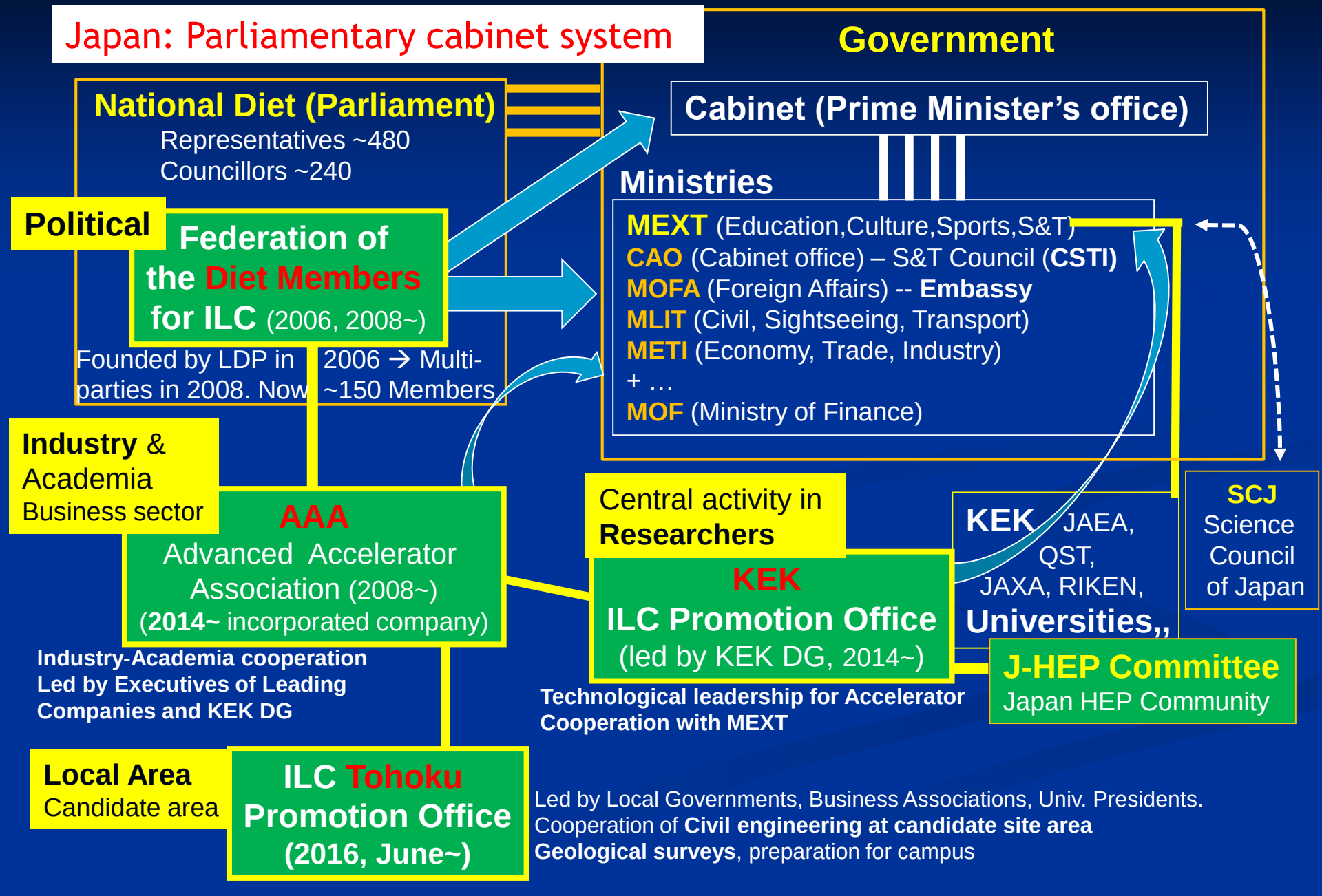
- 250 GeV
  - Higgs Factory → New Physics, Higgs → DM, Higgs - CPV
  - Dark Matter Hunt → New physics
  - SM Measurements → Z' effect , New physcis
- ~350 GeV
  - Higgs Factory
  - Top Factory
  - Dark Matter Hunt
  - Z' effect
- 500GeV → 1 TeV → 3 TeV (if 90 MV/m)
  - Higgs Factory, Double Higgs production, Dark Matter, Z'

- Urgent NEED
  - Lattice QCD + pQCD → b mass, c mass
  - Combined analyses of ILC with LHC, HL-LHC, superKEKB, cosmic, etc..
  - Detector optimization based on Physics and cost..
  - More analyses (potential) of New Physics reach at 250 GeV, 350GeV, 500 GeV, multi-TeV
  - Possibility of connect to other field (AI, etc)

ILC Milestone (Tentative)



ILC Promotion Bodies in Japan



Recent Progress: June 2016 – Nov 2016

- **US-Japan** joint discussion group: **cost reduction study started**
- **Progress in Europe & Asia**: **Industry and/or Political interactions**
  - **Spain-Japan** (**May-Jun. 2016**): → Presentation by Prof. Juan Fuster
    - Symposium at Spanish Embassy in Tokyo, on mutually interesting area, "Fusion and Accelerator" related field. → MoU between INEUSTAR and AAA @ Spanish Embassy in Tokyo, Japan in May 2016.
    - Industry-Academia Spain-Japan Workshop at ECFA LC workshop at Santander in Spain in June 2016.
  - **Germany-Japan** (**Oct.**): **parliamentary member interactions**@Tokyo

    Direct discussion for ILC between German Parliament Member and JP Diet members
  - **Europe-Japan & France-Japan** (**Oct.**): parliament & industry members **Interactions** between JP Diet members and a former French Minister of Culture and EU parliament member, at IEEE@Strasbourg → create an entrance window to EU / France politics
  - **India-Japan** (**Oct.**): Parliamentary member interactions, IPU@Geneva, Inter-University organization in formation (Japan: Hon. Shunichi Suzuki)

Presentation by

Pyungwon Ko (KIAS, Korea)

Satoru YAMASHITA
(ICEPP, Univ. of Tokyo, Japan)

Marc BESANCON
(CEA-Saclay/DRF/Irfu)

CEA - Saclay

Brainstorming discussion

Interests and priorities for future collaboration on theory/phenomenology/physics analysis

TYL-FJPPL present (2017)

HEP_01 ILC top
HEP_02 SiW CAL
HEP_04 cosmological test of fund. Phys. (th)
HEP_06 charged lepton flavour violation (th)

FLAV_01 Characterization of the superKEK beam induced bckgnd (Belle 2 commissioning)
FLAV_02 Flavour physics and theoretical challenges for precision (mix th - exp)

HAD_01 ALICE measurements of jets and photons
HAD_02 ALICE forward upgrade di-muon measurement

NU_04 WA105 related R&D
NU_05 precision neutrino Xsection measurements modeling for LBL

MU_01 Comet (J-PARC, g-2/EDM)

ASTRO_02 mapping the CMB polarization (JAXA LiteBIRD satellite mission - and simmons array)

FKPPL present (2017)

ALICE
ALICE-B

CMSIL
CMSRPC

GPD Hadronic physics
MUONS muon physics (g-2)
NEUTRINOS

COMPHS (th)
BEYONDSM (th)
FNPES (th)
H-POTENTIAL (th)
LYAWDM (cosmology th/observation)

FJPPL : Diverse & active
FKPPL : Recent expansion

CEA – Saclay

Brainstorming discussion

Interests and priorities for future collaboration on theory/phenomenology/physics analysis

TYL-FJPPL future (develop/encourage/advertise) ?	FKPPL future (develop/encourage/advertise) ?
Neutrinos physics	Neutrinos physics
Belle 2 Physics	Hadronic Physics (GPD)
Muons	Muons
LHC physics (ALICE, ATLAS) - physics analysis (ALICE, ATLAS?) - phase 2 upgrades (ATLAS ?)	LHC physics (ALICE, CMS) - physics analysis (ALICE, CMS) - phase 2 upgrades (CMS)
Physics at future accelerators (ILC ...)	Physics at future accelerators (ILC ...)
Dark Matter searches ?	Dark Matter searches ?
Astroparticles, Cosmology	Astroparticles, Cosmology
Gravitational Waves (LIGO/VIRGO/KANGA?, LISA ?) ?	Gravitational Waves ?
common exp/pheno/theor projects ?	common exp/pheno/theor projects ?
Others ?	Others ?

Panelists

(Francois LE DIBERDER, Yasuhiro OKADA, Fumihiko SUEKANE)

and floor Discussions

- Physics Topics :
- F*PPL scheme expansion:
- F*PPL scheme role
- F*PPL formats

Physics Topics :

(In addition to those proposed in three presentations)

- Supporting Bottom-up Small projects, in addition to the Big projects, may be helpful :

- Where is $SU(2)_L$ coming from?
fundamental question to be answered

- Higher energy hadron colliders to see the better chance to observe, measure Higgs coupling, rare coupling & rare decay : can be included in FJ/KPPL.

- Lower energy such as rare isotope physics : all the countries (will) have facilities and labs. letting the collaboration easier with stronger motivation.

Physics Topics (continued):

- Astroparticle, very high energy cosmic rays (esp. in FKPPL) needs to be included.

- flavor physics : Belle 2 expt. increases luminosity 40 times, changing completely B-physics. Should prepare for that.

* Questions & further comments

- ILC
  - ✓ 250 GeV upto 500 GeV at onece? : tricky discussion
    solid proposal vs steps for long terms,
  - ✓ size : 20 or 30 km?
    Politician (long term) vs scientists (minimum, concrete)
  - ✓ cost
    one or two detectors? luminosity, etc. matters
    physics vs society, hard to answer

F*PPL scheme expansion:

- Extend further to activities, not within F*PPL scheme yet.

✓ Collaborators usually knew before, then get into FJ/KPPL.

✓ How about encouraging them to work within this scheme?

* Comments :

✓ Examples exist. Maybe should push further.

✓ No need for extra funding.

- CMS collaboration through CERN was indep of FKPPL, may come into FKPPL scheme near future.

- FCPPL in addition to FJ/KPPL:
  - ✓ In China, many strong groups, many students & postdocs, faculty, working on wide range of topics.
  - ✓ bottom up approach, through collaboration

- Bilateral (F-J or K-PPL) to trilateral (F-J&K-PPL)
  - ✓ There exists some such projects,
  - ✓ Nicer to promote further.

- Exchange of students & postdocs btw two countries :

- May be useful for Master students e.g., in Japan :

Ex) Master student in Tohoku U. coming to France few weeks,
Note : Japanese Master students have topic to study already, with more inspiration.

Comments :

✓ budgets needed for small projects such as Master's students are not much, unlike Ph.D? steel much?

✓ May be able to utilize the budgets allocated in French embassy.

F*PPL scheme role

- F*PPL serves as a good model of collaboration.

- May serve as the input for the strategy.

Ex) it is conceivable to propose in Europe
based on F*PPL project documents.

F*PPL formats

How about theo.- Exp. balance & collaboration?

Present :

- More concentrated to the collaborators, rather than communicating with others
- talking only to the collaborators, not with others.
- Hence no new proposal.

Future :

- Need to encourage new collaboration.
- Needs to see more new ideas throught the collaboration especially btw expt. & theory

- For this,
  - ✓ May need new way of session running,
  - ✓ may need some more inspiring talks to encourage the new collaboration.
  - ✓ In the future, theory contributes to the expt (& vice versa).

- If not,
  same people, same topic, which is not healthy

- Need more young people in next few years.

Thank you!

Merci!

ありがとう!

감사합니다!