Report from Physics Coordinator

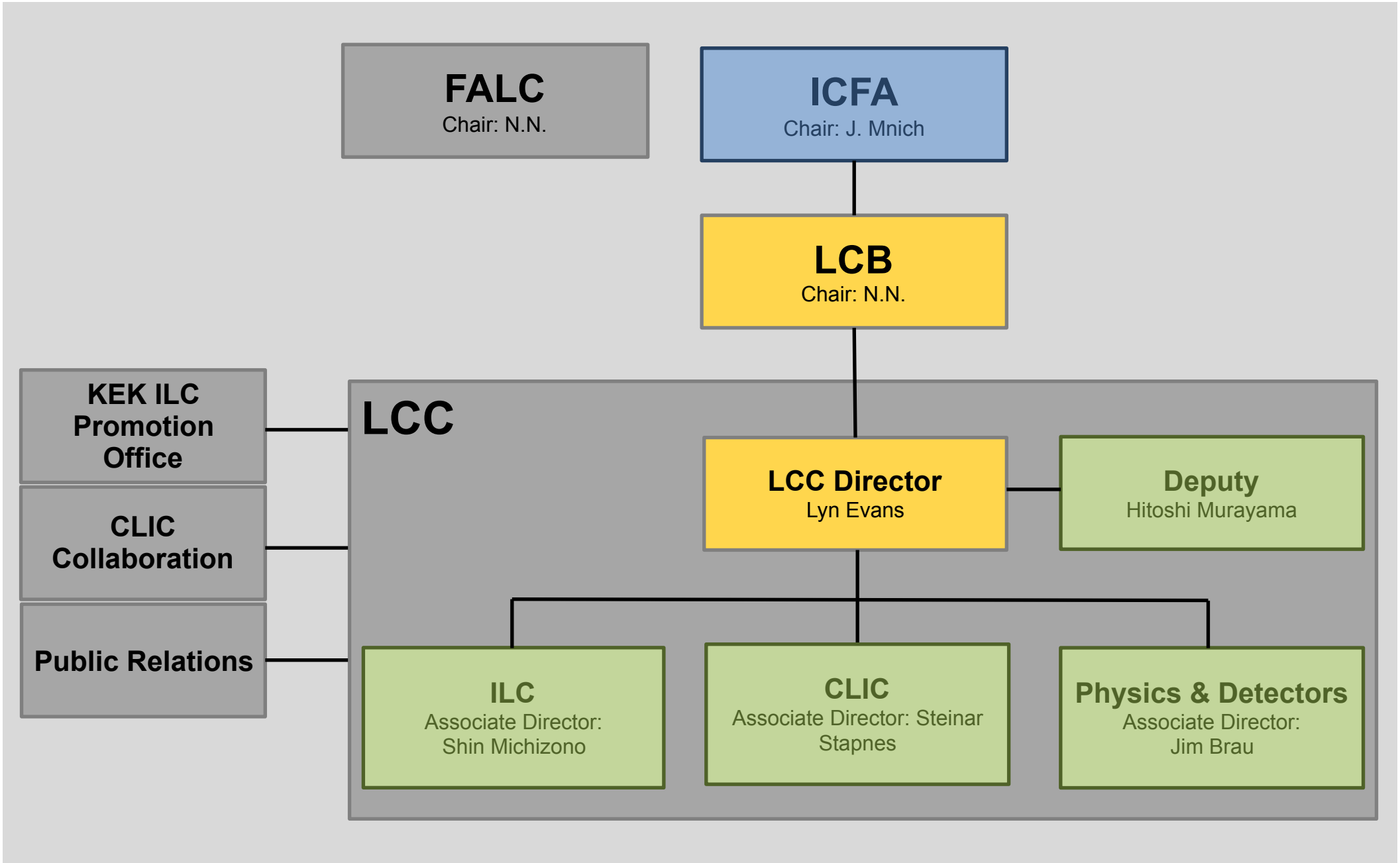
Keisuke Fujii

Dec. 14, 2016

New LCC Structure

from Lyn's plenary talk on the first day

LCB/LCC Organization 2017



The staging option resurfaced again!

again from Lyn's plenary talk on the first day

Cost reduction efforts

- **Bilateral DOE/MEXT decision to concentrate effort on cost reduction.**
- **Unwanted consequence is that all design effort has to stop in USA.**
- **More effort on SCRF.**

Cost reduction

- All of these measures will reduce the cost by 10-20%, but that is not enough for a realistic project funding.
- The beauty of a linear collider is that it can be staged.
- Serious discussions must now start on realistic staging scenarios to bring the cost of the first stage down.

Issues and questions

- Positron production at low energy.
- How important is polarization?
- How interesting is gamma-gamma?

Hon. Kawamura's Keynote Speech

US-Japan S&T Forum, February 12th ,2016 at Hudson Institute Washington D.C.

Hon. R. Shionoya
Hon. S. Suzuki
Hon. T. Otsuka

From the transcript of his speech

https://agenda.linearcollider.org/event/7371/contributions/37634/attachments/30816/46112/Speech_by_Hon_Kawamura_LCWS2016_English.pdf

Starting with the US and Japan, we now have an entry point to the governments and parliaments in Europe and in Asia. But the main part of the battle is just ahead of us. **Cost reduction is an especially pressing and challenging issue, which must be surmounted by worldwide efforts.**

The ITER project, which I worked on as Minister of MEXT, was realized by significantly reducing the original cost. For Japan and other countries, **the lower the costs are, the faster the negotiations would progress and hence the faster the realization. Thus it is of utmost importance to reduce the cost.** However, we cannot afford to spend too much time on cost reduction. **What will happen next year will be critical.** Though many hard decisions will have to be made, it is our hope that prospects and direction will be shown in a timely manner.

“Science First” with ILC !

Priority No.1 = to realize ILC

What we need =

- **clear physics case**

Priority No. 2 = to realize ILD

What we need =

- **detector design, which is cost effective and technically feasible, to realize the physics**

Support Document that follows up the ICFA letter

First authors' meeting held on Sep. 9

Discussed the structure and basic ideas about contents together with how to share the writing.

2nd authors' meeting held on Oct. 13

Reviewed the status of the draft and discussed the request from JHEPC and possible readjustment of the contents of the document.

3rd authors' meeting held on Nov. 1

Reviewed the status of the draft (significant progress, but there are still missing parts, expected to be filled in shortly) and discussed the timeline until LCWS 2016.

4th authors' meeting held on Nov. 16

Reviewed the status of the draft (significant progress, most part filled). All the part to be filled and frozen by next Monday for final editing by Jenny and KF until Nov. 28.

5th authors' meeting held on Dec. 13

Reviewed the status of the draft. Loose ends identified. The current draft is 47 pages long but we decided not to shorten it but to provide an executive summary consisting of 10 or so bullet points. Disclaimer concerning staging options will be added in the introduction. Michael will expand and generalize the DM treatment.

A draft has been sent to LCC physics WG and LCC physics&detector EB. No comments so far but, we will try to finish this up by the of January 2017.

Physics focus schedule

Dec 14: Top/QCD (KF)
Jan 11: Higgs/EW (Jenny)
Jan 25: BSM (Frank)
Feb 8: Top/QCD (Akiya)

Clarification:
Software talks (organised by Frank&Akiya) will come in addition, as well as the overall software and physics coordination updates in the beginning of each meeting.

Conveners' ML:
ild-physics-conveners@desy.de

Use this mailing list to send your talk request.

Subgroup meetings

need to be reactivated.

Backup

Benchmark Studies

benchmark processes for detector optimisation

process	physics	detector	Ecm	
H—>cc	BR	c-tag JER	any	H.Ono
H—>μμ	BR	high P tracking	500 GeV	S.Kawada
H—>ττ	BR, CP	τ reconstruction, PID track separation	250 GeV	D.Jeans
H—>bb	M_H, BR	JES, JER b-tag	500 GeV	A.Ebrahimi J.Tian
H—>invisible Z—>qq	Higgs Portal	JER	250 GeV	Y.Kato
evW—>evqq	M_W, TGC	JES, JER	500 GeV	K.Cotera G.Willson
tt-bar—>6-jet	top coupling A_{FB}	b-tag, JER jet charge	500 GeV	S.Bilokin Y.Sato
$\chi_1^+\chi_1^-$, $\chi_2^0\chi_1^0$ near degenerated	natural SUSY	low P tracking PID	500 GeV	J.Yan
γXX	WIMPs	Photon ER & ES Hermiticity	500 GeV	M. Habermehl

in total 9 = 5 (Higgs) + 2 (EW) + 2 (BSM) ***fully covered!***

Subgroup Activities

1. Higgs/EW WG (Junping Tian, Graham Wilson)

1. Higgs CP: H→τ+τ- in vvH (Vladimir Bocharnikov: ITEP) ***New***
2. **Higgs CP: H→τ+τ- in ZH (Daniel Jeans)** → Dec.8
3. **Anomalous HVV couplings (Tomohisa Ogawa)** → Dec.8
4. Higgs CP: ttH (Tomohisa Ogawa)
5. mH reconstruction using H→bb (Ali Ebrahimi)
6. **mH reconstruction using H→bb (Junping Tian)** → Dec.8
7. H→bb/cc/gg (Hiroaki Ono)
8. **H→WW in ZH (Mila Pandurovic)** → Dec.7
9. H→μ+μ- (Shin-ichi Kawada)
10. **H→invisible (Yu Kato)** → Dec.8
11. **HHH using HH→bbbb (Claude Duerig)** → Dec.6
12. HHH using HH→bbWW* (Masakazu Kurata)
13. **HHH : model indep. analysis with EFT (Junping Tlan)** → Dec.6 (Tim B.)
14. mW with single W production (Katsu Kotera)
15. **Precision EW studies incl. mW, Z-pole (Graham Wilson)** → Dec.6

Beam energy/luminosity spectrum calibration: a common issue for precision mass measurements (mW, mH, mt)

News about documentation

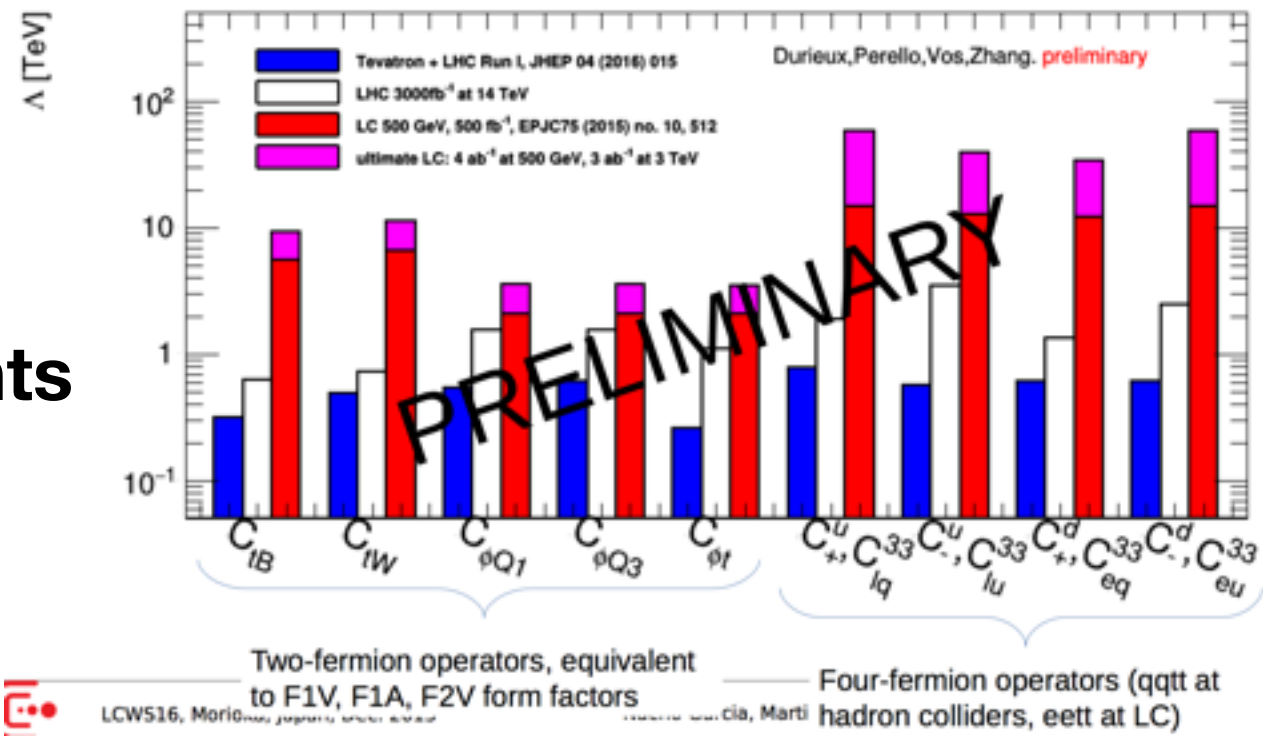
- vvH, H→bb/cc/gg (separating ZH and WW-fusion) @ 350 GeV: PhD thesis by F. Mueller (DOI: 10.3204/PUBDB-2016-02659) (DESY-THESIS-2016-018).
- Higgs self-coupling, state-of-the-art ZHH analysis @ 500 GeV: PhD thesis by C. Duerig (DESY-THESIS-2016-027)
- Leptonic recoil analysis @ 250, 350, 500 GeV: **published yesterday in Phys. Rev. D94 (2016) 113002**, by J.Yan, et al.
- Higgs CP measurement using H→ττ @ 250 GeV: *draft being reviewed in ILD*, by D.Jeans

Subgroup Activities (continued)

2. Top/QCD WG (Roman Peoschl, Hitoshi Yamamoto)

1. e+e- → tt : semi-leptonic (Sviatslav Bilokin)
2. **e+e- → bb (Sviatslav Bilokin)** →Dec.6 (R.Poeschl)
3. **e+e- → tt : bbμ+μ-νν: MEM (Yo Sato)** →Dec.7
4. mt reconstruction at 1TeV or higher (Nacho Garcia, Martin Perello, Philipp Roloff, Rickard Strom) with CLICdp →Dec.8 (R.Strom)
5. **mt using radiative return to threshold (Março Boronat and Pablo Gomis)** →Dec.8 (M.Vos)
6. **Global fit with D6 EFT (Martin Perello, et al.)** →Dec.6 (M.Vos)

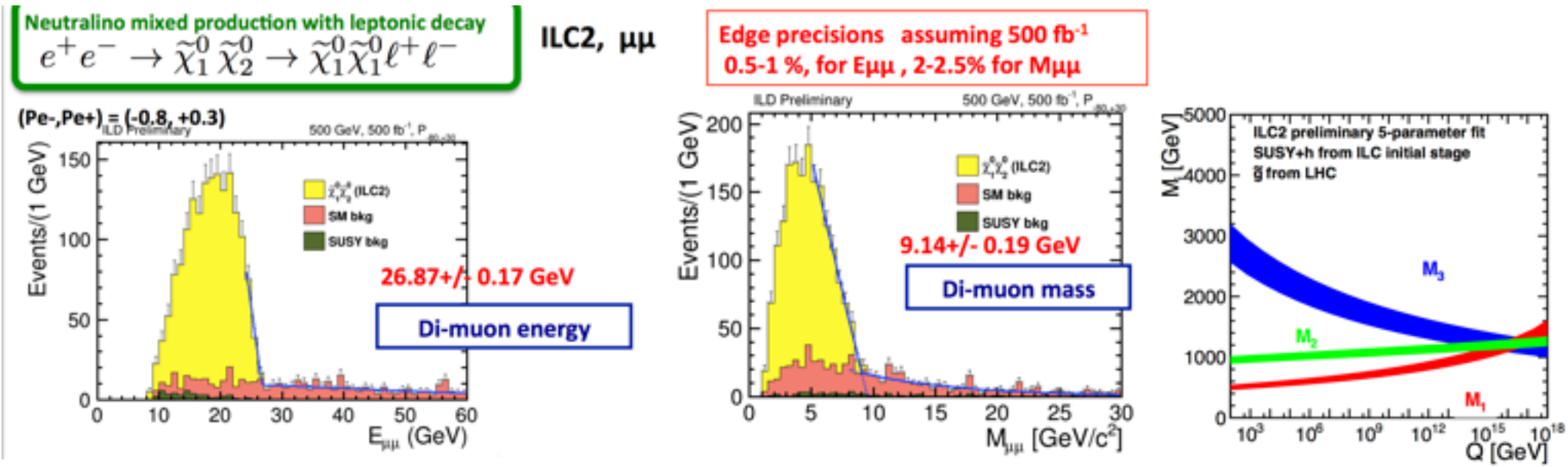
Form factors
→ EFT coefficients



Subgroup Activities (continued)

3. BSM WG (Mikael Berggren, Jacqueline Yan)

1. **Generic WIMP searches (Moritz Habermehl)** → Dec.8 (T. Tanabe)
2. **SUSY co-annihilation (Mikael Berggren)** → Dec.8
3. **Higgsinos (Jacqueline Yan)** → Dec.8
4. **SUSY parameters from Higgsinos (Suvi-Leena Lehtinen)** → Dec.8



News about documentation

- "Di-photon resonances at the ILC" (Junping Tian, KF, Hiroshi Yokoya) : Phys. Rev. D94 (2016) no.9 095015

Uncovered Topics

From κ_x to EFT

Precision H/t studies are moving to EFT for more model-independent analyses.
→ Need more precision measurements that constrain various EFT coefficients

- e+e- → H γ
- e+e- → WW, WWZ, … (TGC, QGC, etc.)
- 2-fermion processes :
  e+e- → e+e-, μ+μ-, τ+τ-, qq (light), cc)