Towards the JAHEP input to the EPPSU

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JAHEP website: https://www.jahep.org/en/index.html

JAHEP and CFP (Committee for Future Projects)

JAHEP (Japan Association for High Energy Physics)

- Representing HEP community in Japan (~800 members)
  - Separate communities for particle theories, nuclear and astrophysics
- Most of HEP researchers (incl. PhD students) are members

HEPC (High Energy Physics Committee)

- Executive committee for JAHEP (10+1(theo.)+4(KEK) members)
- Members (mandate of 2 years) are determined by elections
- Chair: T. Nakaya (Kyoto U.) 2023-25 (until September)

JAHEP HEP community

interaction/
collaboration

KEK HEP central lab.

Under-committees

CFP (Committee for Future Projects)

- Committee discussing future projects
- Consisting of younger researchers (age of <50)
- 28 members (Chair: Yasu Okumura (U. Tokyo))
  - Incl. 3 theorists and 5 acc. Physicists
  - 6 LHC, 2 ILC, 6 flavor, 6 ν/others

ILC-Japan

- Steering Japanese ILC activities
- Chair: M. Ishino (U. Tokyo)
- Consisting of ILC + non-ILC members
- 4 WG/TFs (phys, det, acc, PR)

Members

High Energy Physics Committee

2023.9～2025.8		
Chairperson	Tsuyoshi NAKAYA	Kyoto University
Secretary	Masaya ISHINO	The University of Tokyo・ICEPP
	Yutaka USHIRODA	KEK・IPNS
	Toshinori MORI	The University of Tokyo・ICEPP
Member	Atsuko ICHIKAWA	Tohoku University
	Yasuyuki OKUMURA	The University of Tokyo・ICEPP
	Masao KURIKI	Hiroshima University
	Ken SAKASHITA	KEK・IPNS
	Shinichiro MICHIZONO	KEK・Accelerator Laboratory
	Satoru YAMASHITA	Iwate Prefectural University
Theory member	Ryuichiro KITANO	KEK・IPNS
Ex Officio Member	Masanori YAMAUCHI(～2024.3) Shoji ASAI(2024.4～)	KEK・Director General
	Yasuhiro OKADA(～2024.3) Kazunori HANAGAKI(2024.4～)	KEK・Executive Director
	Naohito SAITO	KEK・Director, Institute of Particle and Nuclear Studies
	Tadashi KOSEKI	KEK・Director, Accelerator Laboratory

CFP members

2024.1～		
Yasuyuki OKUMURA	The University of Tokyo・ICEPP	Chairperson
Yoshinori ENOMOTO	KEK・ACCL	Secretary
Hideyuki OIDE	KEK・IPNS	Secretary
Kazuyuki SAKAUE	The University of Tokyo	Secretary
Tsunayuki MATSUBARA	KEK・IPNS	Secretary
Kazuki UENO	Osaka University	
Kenta UNO	KEK・IPNS	
Yuji ENARI	The University of Tokyo・ICEPP	
Hidetoshi OTONO	Kyushu University	
Shusei KAMIOKA	KEK・IPNS	
Ryuichiro KITANO	KEK・IPNS	
Takayuki KUBO	KEK・ACCL	
Koji SHIOMI	KEK・IPNS	
Taikan SUEHARA	The University of Tokyo・ICEPP	
Yu NAKAHAMA	KEK・IPNS	
Natsumi NAGATA	The University of Tokyo	
Koji TSUMURA	Kyushu University	
Junping Tian	The University of Tokyo・ICEPP	
Kaori HATTORI	AIST	
Shigeki HIROSE	University of Tsukuba	
Megan Friend	KEK・IPNS	
Yasuhiro FUWA	JAEA	
Takahiko MASUDA	Okayama University	
Kodai MATSUOKA	KEK・IPNS	
Kenji MISHIMA	KEK・IMSS	
Gaku MITSUKA	KEK・ACCL	
Roger Wendell	Kyoto University	
Hiroko WATANABE	Tohoku University	

Mandate of CFP

- Previous CFP (2022-23): investigate ILC and alternatives
  - 3 major directions: ILC-like collider, flavor physics and muon collider
  - Listing situations and issues, but no clear conclusion
- This term (2024-26) aims for Japan HEP strategy update in 2026
  - Updating previous ones (2012, and minor update in 2017)
  - Draft the update in End of 2025 by CFP → refine with HEPC in 2026
  - Covering plans of all major HEP projects (not only ILC/Higgs factory)
  - Strategy starting at 2026 but should include a view of > 10 years
- Originally planned to align with next European strategy
  - But the European strategy comes earlier than expected
    → Modify the mandate by "2-stage approach" (next page)

CFP activities for European Strategy

- Additional mandate in 2024, given by HEPC in April 2024
  - Prepare draft for European strategy input in End 2024
    - Only covering Higgs factory aspects, but both LC and circular colliders
    - Other major projects (SuperKEKB/Belle II, J-PARC, ...) be covered by HEPC
  - Investigate e+e- Higgs factories (ILC and others (FCC, CEPC, ...)) on
    - Importance of physics
    - Maturity and prospects of technologies, necessary resources, international situations
    - Will of Japanese researchers towards these projects

  and (if possible) propose how these projects should be placed on JAHEP future projects, with close communication with HEPC and ILC-Japan
    - By issuing a report at end of 2024

Evolution of discussions

- April 2024: kickoff → meeting ~every week (main + subgroup)
  - Investigation phase: summarize current status and discussion topics
    - Physics: review focused topics (EW hierarchy, baryogenesis, DM)
    - Detector: investigate HF detectors and DRDs, difference on linear/circular
    - Accelerator: investigate issues/maturity on circular/linear technologies
    - Project: review major HF projects (ILC, FCC, CEPC, …)
- August – September: wrap-up and discussions
  - CFP camp (August 2024, 3-days), townhall meeting (September 2024)
- September – December: drafting 2024 reports
  - CFP reports 2024 for Higgs factories (for JAHEP internal)
  - Draft for EPPSU (to be reviewed/modified with JAHEP before published)

Snapshot from townhall meeting in September

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Comparison at-a-glance

	円形 (Circular)	線形 (Linear)
典型的な特徴 Typical Features	ルミノシティーが高い (Higgs 3年) 超高輝度Z-pole運転が可能 High luminosity (Higgs 3 years) Ultra-high luminosity Z-pole operation possible	偏極が可能 Polarization possible
e+e- エネルギー拡張性 e+e- Energy Expandability	放射光でリミットされるため 380 GeVより上は困難 Limited by synchrotron radiation, difficult above 380 GeV	LCはエネルギー拡張性あり (3TeVまで) High energy expansion possible (up to 3 TeV)
将来の展望 Future Prospects	ハドロンコライダーへの転用（磁石） Application to hadron collider (magnets)	エネルギー拡張（加速技術） Energy expansion (acceleration technology)
トンネルサイズ Tunnel Size	~100km	~20km (250GeV) – 33.5km (500GeV)
経験 Experience	円形のコライダーは経験豊富 （リスク低減） Extensive experience with circular colliders (risk mitigation)	SLCしか線形コライダーの経験はない (チャレンジング) Only experience with linear collider is SLC (challenging)
日本の加速器技術 Japanese Accelerator Technology	Tristan. KEKB, SuperKEKBの経験・技術 ナノビーム、ビーム制御、 高電流ビーム、陽電子源、SRF etc Experience and technology from Tristan, KEKB, SuperKEKB	ILCの開発研究 SRF (STF)、ビーム制御 (ATF)、陽電子源 Development research for ILC Nano-beam, beam control, SRF (STF), beam control (ATF), positron source

Y. Okumura

In summary, significant change from previous strategy is mildly proposed:
- Previous strategy solely focused on realization of ILC as a Higgs factory
- The coming strategy should include contribution also for overseas Higgs factories (including circular colliders) → community survey to check opinions

CFP community survey

- Survey in Sep.-Oct. for JAHEP researchers/students
  - Obtain ~200 answers (cf. JAHEP members ~ 800)
- Mainly asking will to contribute/support Higgs factory projects
  - ILC in Japan, FCCee, future hadron colliders in CERN, CEPC
  - Also checking level of understanding
  - Also accepting written comments
- General tendency gives
  - 60-70% are willing to support and contribute ILC
    - Some people concerns project uncertainty and resource demand
  - 90% supports FCCee, 50% willing to contribute related studies
- CFP feels community generally supports the proposed direction

CFP drafting activity

- Drafting team: 6 members (including myself)
- Meets ~every week from end Sep. – early Dec.
- Review draft almost line-by-line
- Being reviewed by main committee (~every 2 weeks)
  - Main discussion points / significant change at drafting team reviewed at the meetings
- Discussion with HEPC in November → receive some opinions
- Finalize it in early December → some modification required from several directions → final version submitted in end of 2024

Two completed CFP documents

欧州戦略へのインプットに掲載する
ヒッグスファクトリーに関する文章のCFP案

江成 祐二[6], 榎本 嘉範[†5], Megan Friend[6], 不破 康裕[13], 服部 香里[7,8], 廣瀬 茂輝[11], 上岡 修星[6], 北野 龍一郎[6], 久保 毅幸[5], 増田 孝彦[2], 松原 綱之[†6], 松岡 広大[6], 三島 賢二[12], 三塚 岳[5], 永田 夏海[9], 中浜 優[6,7], 生出 秀行[†6], 奥村 恭幸[*9], 音野 瑛俊[3], 坂上 和之[†9], 塩見 公志[6], 末原 大幹[9], Junping Tian[9], 津村 浩二[3], 上野 一樹[1], 宇野 健太[6], 渡辺 寛子[10], Roger Wendell[4]

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Version 1.0
2024 年 12 月 24 日

Draft from CFP for EPPSU input about Higgs factories
24th Dec. 2024, 3.5 pages

- Written in Japanese
- Circulated within JAHEP (not open to public)
- Essentials in next page

CFP report 2024

江成 祐二[6], 榎本 嘉範[†5], Megan Friend[6], 不破 康裕[13], 服部 香里[7,8], 廣瀬 茂輝[11], 上岡 修星[6], 北野 龍一郎[6], 久保 毅幸[5], 増田 孝彦[2], 松原 綱之[†6], 松岡 広大[6], 三島 賢二[12], 三塚 岳[5], 永田 夏海[9], 中浜 優[6,7], 生出 秀行[†6], 奥村 恭幸[*9], 音野 瑛俊[3], 坂上 和之[†9], 塩見 公志[6], 末原 大幹[9], Junping Tian[9], 津村 浩二[3], 上野 一樹[1], 宇野 健太[6], 渡辺 寛子[10], Roger Wendell[4]

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Version 1.0
2024 年 12 月 24 日

CFP report 2024
24th Dec. 2024, 14 pages

- Written in Japanese
- Circulated within JAHEP (not open to public)
- Longer document including discussions not related to EPPSU aspects (but still dedicated for Higgs factories)

Essentials of CFP draft for EPPSU

Preliminary contents of the current draft; final output may change significantly

- Generic endorsement of realizing any Higgs factory
  - Japanese community should make efforts to maximize possibility to realize (at least one) Higgs factory anywhere in the world
  - Regardless of linear or circular implementations
- We will lead international efforts to realize ILC in Japan as a global project by advancing ongoing activities
  - ILC is the only project possible to be located in Japan
  - Encourage young researchers to involve to further activate the project
- Increase possibility to realize Higgs factory by actively involving overseas projects
  - Especially collaborating on topics related to expertise of our projects (e.g. KEKB)
  - Also pursuing activities contributing both linear and circular Higgs factories
- Additional comments
  - Global project is a good form for future large project, collaboration desired
  - Will monitor report from Higgs factory projects and update this report if necessary

Discussions

- Linear colliders vs Circular colliders
  - To be hosted in Japan, we can only think linear collider, not circular collider
    - Circular collider is too big for Japan
  - For overseas, CFP does not conclude which one is more favored
    - Linear: energy upgradability, polarization, smaller footprint, lower cost (?)
    - Circular: more luminosity, upgradable to hadron colliders
- Global project
  - The concept of the global project should be important for us in general
  - International consensus on the value of the global project concept and international efforts to seek solutions to these challenges are essential

Procedure towards EPPSU submission

- CFP online mini-townhall meeting: 16th Jan.
  - Explain the EPPSU draft and CFP report
  - Discussion and collect feedback
- Online form to collect feedback to the report (by CFP)
- HEPC+CFP drafting session: mid Feb.
  - Drafting group: selected HEPC members and CFP drafting group
  - Based on CFP draft (to be translated in English)
    and extended scope of ongoing projects (such as Belle II, T2K/HK)
- Feedback from community? (by HEPC?)
- Release to public and submit to EPPSU in End of March
- Monitor other EPPSU input and modify the input if necessary
  - According to the EPPSU updating schedule

Summary

- Intensive work has been done (and being done) for future strategy of Japanese HEP community
- CFP issued reports for Higgs factory part of EPPSU input
  - Maximizing the chance to realize a Higgs Factory is our top priority
  - Pursuing ILC in Japan as a global project
  - Contribution to overseas Higgs factory with Japanese expertise
- Final report will be public by March 2025
  - With final modification session in February by CFP+HEPC team