

KMI2025 IAB Meeting

Recent Activities and Future Plan

Toru Iijima / Director KMI
March 5, 2025



Kobayashi-Maskawa Institute
for the Origin of Particles and the Universe



Flavor Physics International Research Center
フレーバー物理学国際研究センター

Welcome to KMI, Nagoya



Today's Time Table

	Greetings <i>Nagoya University</i>	<i>Toru Iijima</i>  14:30 - 14:35
	Report on recent activities and future plan <i>Nagoya University</i>	<i>Toru Iijima</i> 14:35 - 15:00
15:00	Division of Theoretical Studies <i>Nagoya University</i>	<i>Tetsuya Shiromizu</i> 15:00 - 15:20
	Division of Experimental Studies <i>Nagoya University</i>	<i>Toru Iijima</i> 15:20 - 15:40
	Flavor Physics International Reserach Center <i>Nagoya University</i>	<i>Toru Iijima</i>  15:40 - 15:50
	Dark Matter Physics International Reserach Center <i>Nagoya University</i>	<i>Hiroyasu Tajima</i>  15:50 - 16:00
16:00	Coffee <i>Nagoya University</i>	16:00 - 16:30
	Discussion <i>Nagoya University</i>	16:30 - 16:50
17:00	Closed Session <i>Nagoya University</i>	16:50 - 17:30
	Comments by IAB <i>Nagoya University</i>	17:30 - 17:40
	Discussion <i>Nagoya University</i>	17:40 - 17:55
	Conclusion <i>Nagoya University</i>	<i>Toru Iijima</i> 17:55 - 18:00
18:00		

IAB members

2023

- John Ellis
- Satoshi Iso
- Takaaki Kajita
- Hitoshi Murayama
- Misao Sasaki (chair)
- Joseph Silk
- Masanori Yamauchi



2025

- John Ellis
- Satoshi Iso
- Takaaki Kajita
- Hitoshi Murayama
- Misao Sasaki (chair)
- Joseph Silk
- Shoji Asai

IAB report

We would like to ask the IAB to give us a report about KMI after this meeting. Your valuable evaluation and suggestion to KMI are important to us.

History

Physics at Nagoya University

- 1955 Sakata Model for hadrons
- 1962 Maki-Nakagawa-Sakata Matrix
- 1965 The first X-ray rocket in Japan
- 1971 Kyoshi Niu found charm quark event in CR.
(1974 Charm quark was detected at SLAC &BNL)
- 1973 Kobayashi-Maskawa matrix
- 2000 Tau neutrino discovery (DONUT at Fermilab)
- 2001 CP symmetry breaking (Belle at KEKB factory)
- 2008 Nobel prize for Kobayashi-Maskawa matrix**
- 2010 Establishment of KMI**
- 2010 Observation of a first tau neutrino (OPERA)
- 2012 Discovery of Higgs particle
- 2015 The fifth tau neutrino (OPERA)



Shoichi Sakata



Sachio Hayakawa



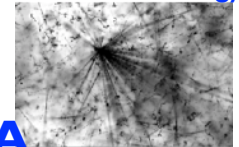
© The Nobel Foundation
Photo: U. Montan
Makoto Kobayashi

© The Nobel Foundation
Photo: U. Montan
Toshihide Maskawa

CKM

PMNS

Unique Nuclear
Emulsion Technology



Crossover of Theory x Exper./Obs. & Particle x the Universe
& Professors x Students

Our Mission in KMI

Shed Light on the Dark Universe



$$\begin{pmatrix} \cos \theta_1 & -\sin \theta_1 \cos \theta_3 & -\sin \theta_1 \sin \theta_3 \\ \sin \theta_1 \cos \theta_2 & \cos \theta_1 \cos \theta_2 \cos \theta_3 - \sin \theta_2 \sin \theta_3 e^{i\delta} & \cos \theta_1 \cos \theta_2 \sin \theta_3 + \sin \theta_2 \cos \theta_3 e^{i\delta} \\ \sin \theta_1 \sin \theta_2 & \cos \theta_1 \sin \theta_2 \cos \theta_3 + \cos \theta_2 \sin \theta_3 e^{i\delta} & \cos \theta_1 \sin \theta_2 \sin \theta_3 - \cos \theta_2 \cos \theta_3 e^{i\delta} \end{pmatrix}$$

$$V_{KM} = \begin{pmatrix} V_{ud} & V_{us} & V_{ub} \\ V_{cd} & V_{cs} & V_{cb} \\ V_{td} & V_{ts} & V_{tb} \end{pmatrix}$$

Dark Universe

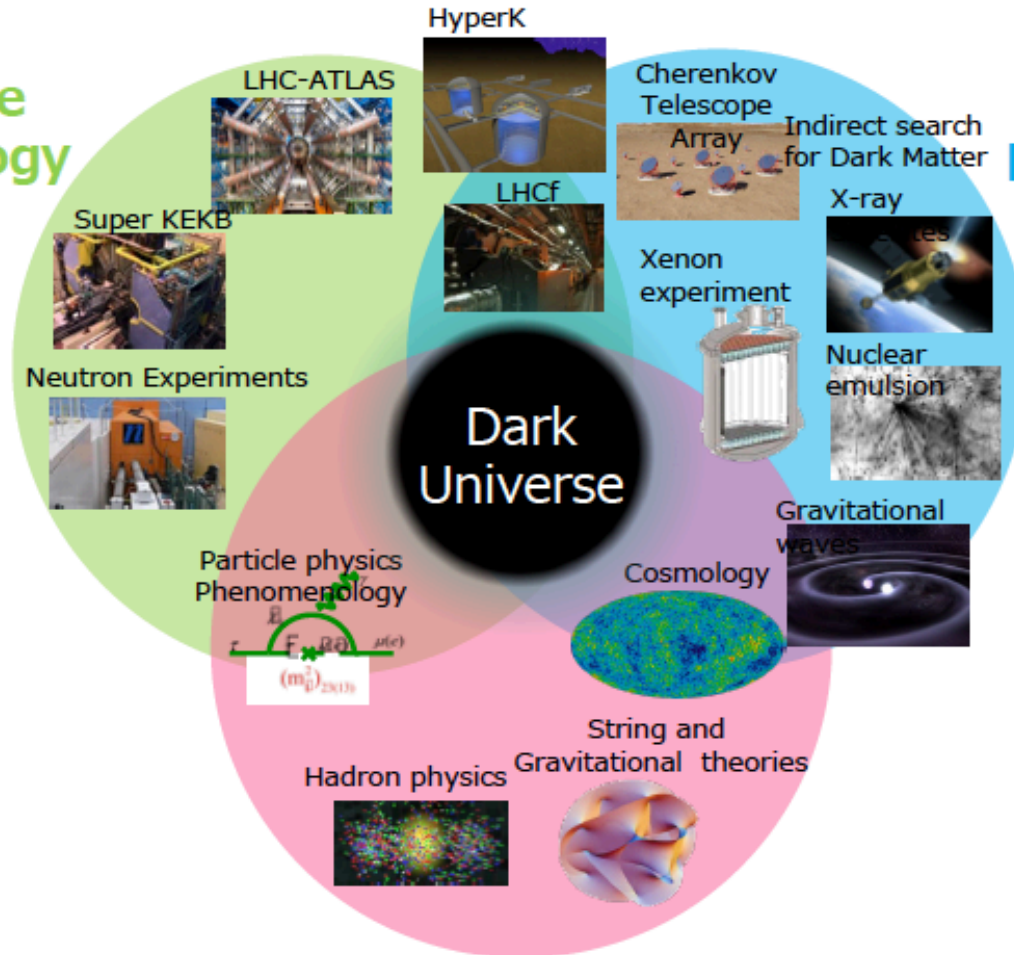
- Dark Energy
- Dark Matter
- Missing anti-matter

$\bar{\nu}_\tau$, $\bar{\nu}_\mu$, μ , π , K^+ , e^-

Beyond Kobayashi-Maskawa.

KMI's Three Rings

New Particle Phenomenology



Astro-particle Phenomenology

Integrative Theoretical Researches

Raising International Collaborations

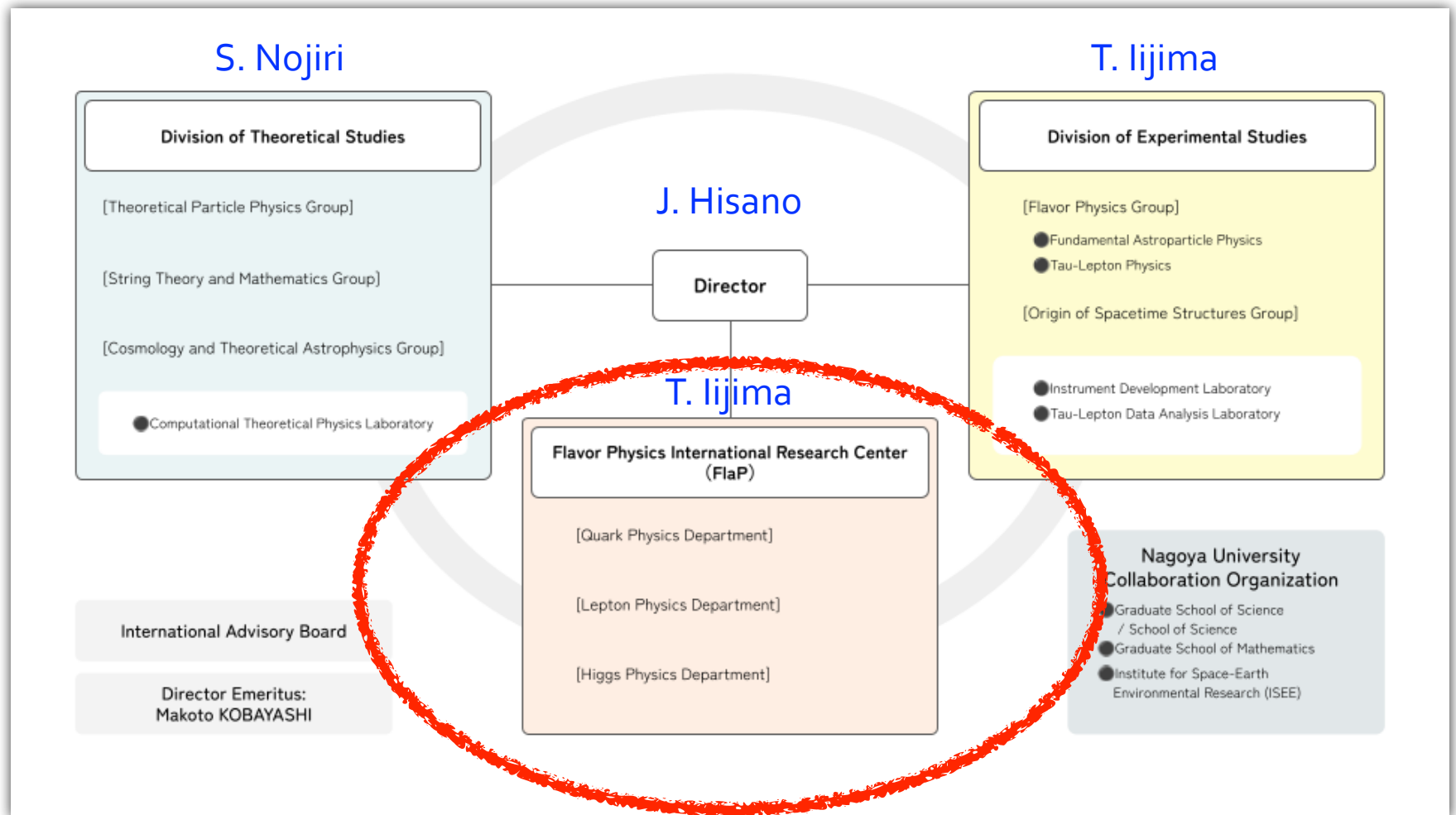
- KMI Symposium
 - Bi-annual meeting to survey physics highlights + topical hot issues
 - Showcase of KMI researches and activities by young scientists (incl. grad students)
 - KMI 2025 in March 5-7, 2025



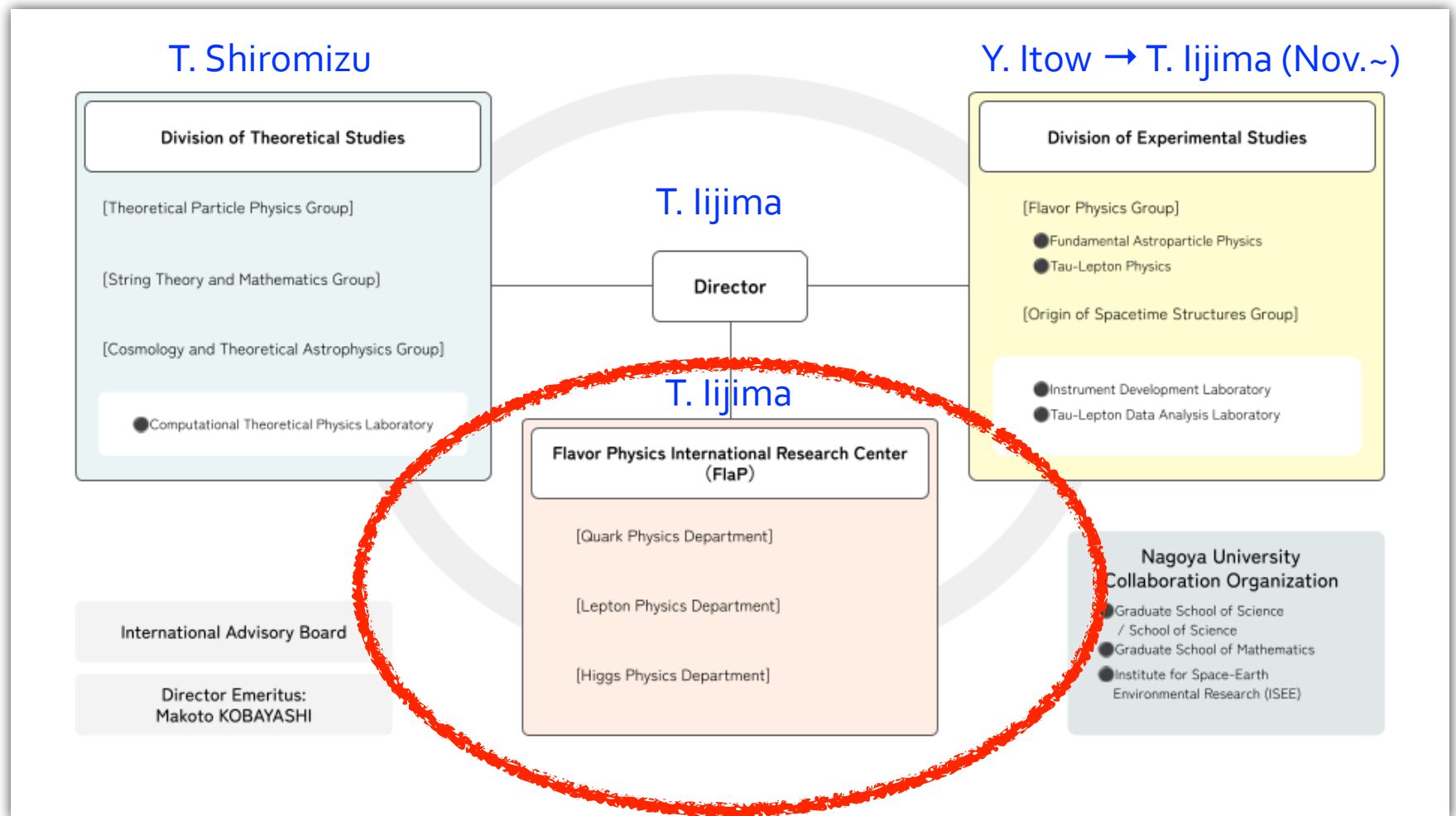
- KMI School
 - School for a dedicated hot topic
 - Lectures, hand-on exercise and seminars
 - Invite young students & PD from all over the world.
- KMI visitors to invite foreign researchers
- Dispatch young researchers to overseas researches



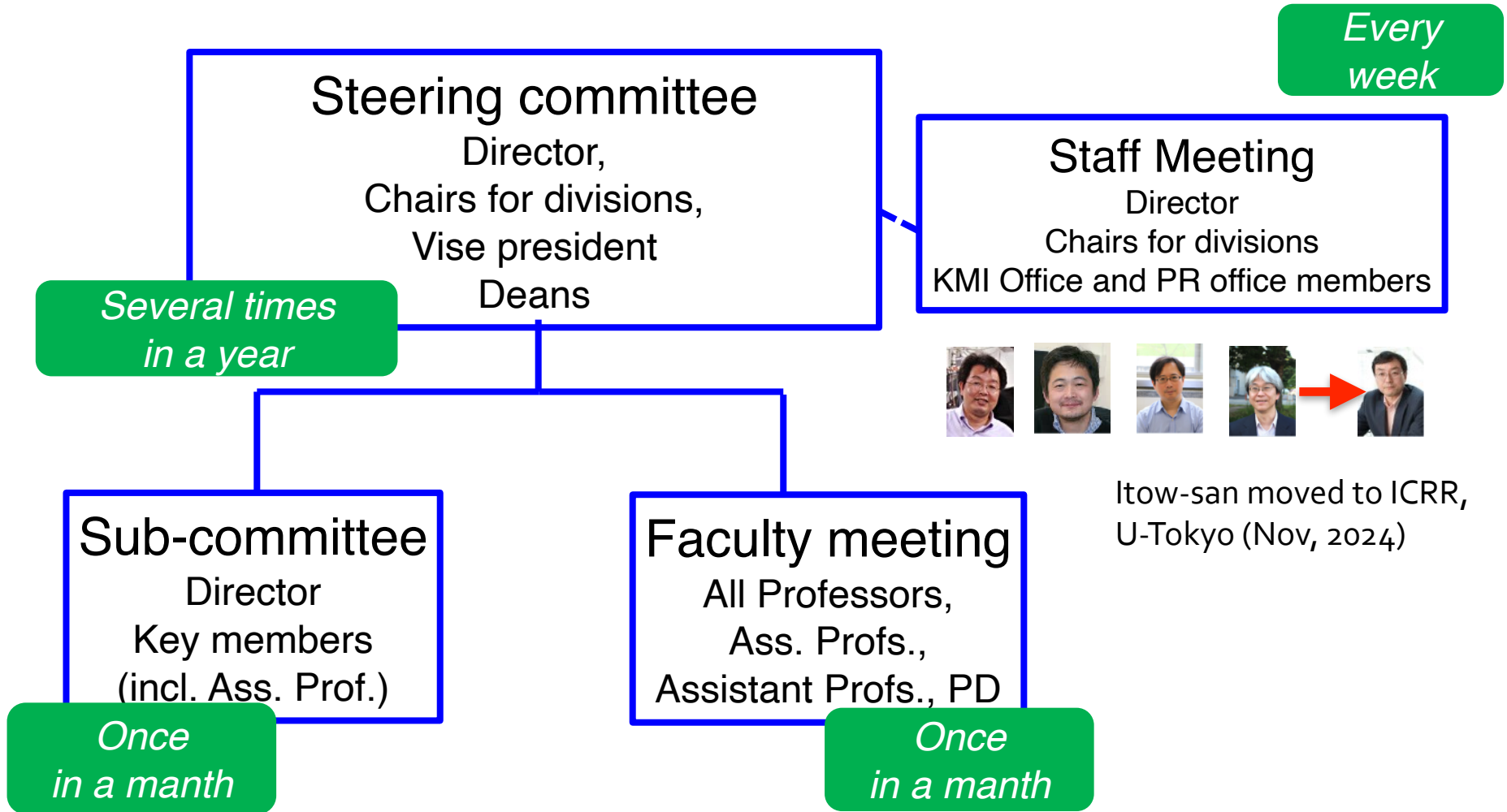
KMI Organization since 2023



KMI Organization since 2024



KMI Management



Budget and Grant

◆ Annual income of KMI

	2020JFY	2021JFY	2022JFY	2023JFY	2024JFY
KMI (機能強化経費相当分) (kJPY)	24,772	24,376	23,986	23,603	23,226
KMI others (kJPY)	4,202	4,390	2,270	2,270	2,270
FlaP (kJPY)				46,201	46,201
total (kJPY)	28,974	28,776	26,256	72,074	71,697

- KMI (機能強化経費相当分) : A part of budget in Nagoya Univ.. 1.6% is decreased every year. About half of the budget is used for salaries for two designated profs. and a researcher in PR office, and office worker(s)
- KMI others: Salary of distinguished professors (Kobayashi-san and Maskawa-san) , their research budgets and so on.
- FlaP: Budget for organizational reform (教育研究組織改革分) ,until 2026JFY → consecutive funding based on evaluation

Budget and Grant

- ◆ Handled by each research groups.

- Scientific Research Grand-in-Aid (Kakenhi)

	2020JFY	2021JFY	2022JFY	2023JFY	2024JFY
# of grant	62	67	73	75	84
total (JPY)	372,353	215,904	325,281	372,904	440,391

- Other Research Funds

	2020JFY	2021JFY	2022JFY	2023JFY	2024JFY
# of grant	7	9	10	13	13
total (JPY)	82,268	37,634	55,524	62,474	61,371

JST FOREST: K. Ichiki (2021~)

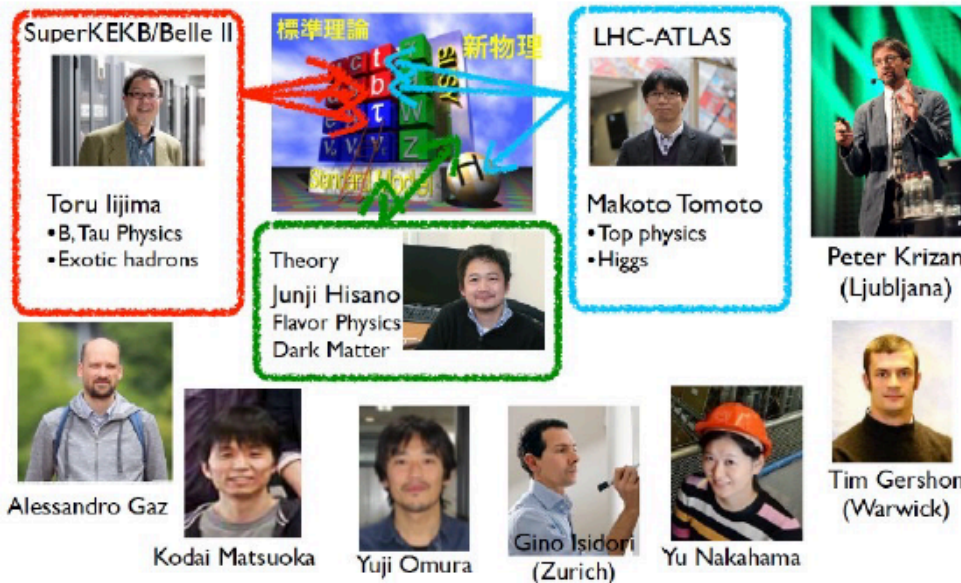
H. Miyatake (2022~)

S. Kazama (2022~)

World Research Unit for Heavy Flavor Physics (Toru Iijima)

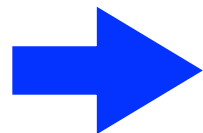
From 2014JFY to 2019JFY

重フレーバー素粒子物理学 国際研究ユニット
World Research Unit for Heavy Flavor Particle Physics



Boost Nagoya's activities for collider experiments/phenomenology, and leadership.

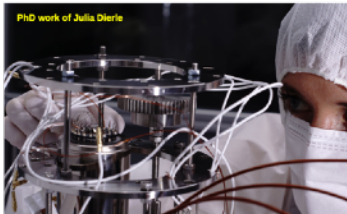
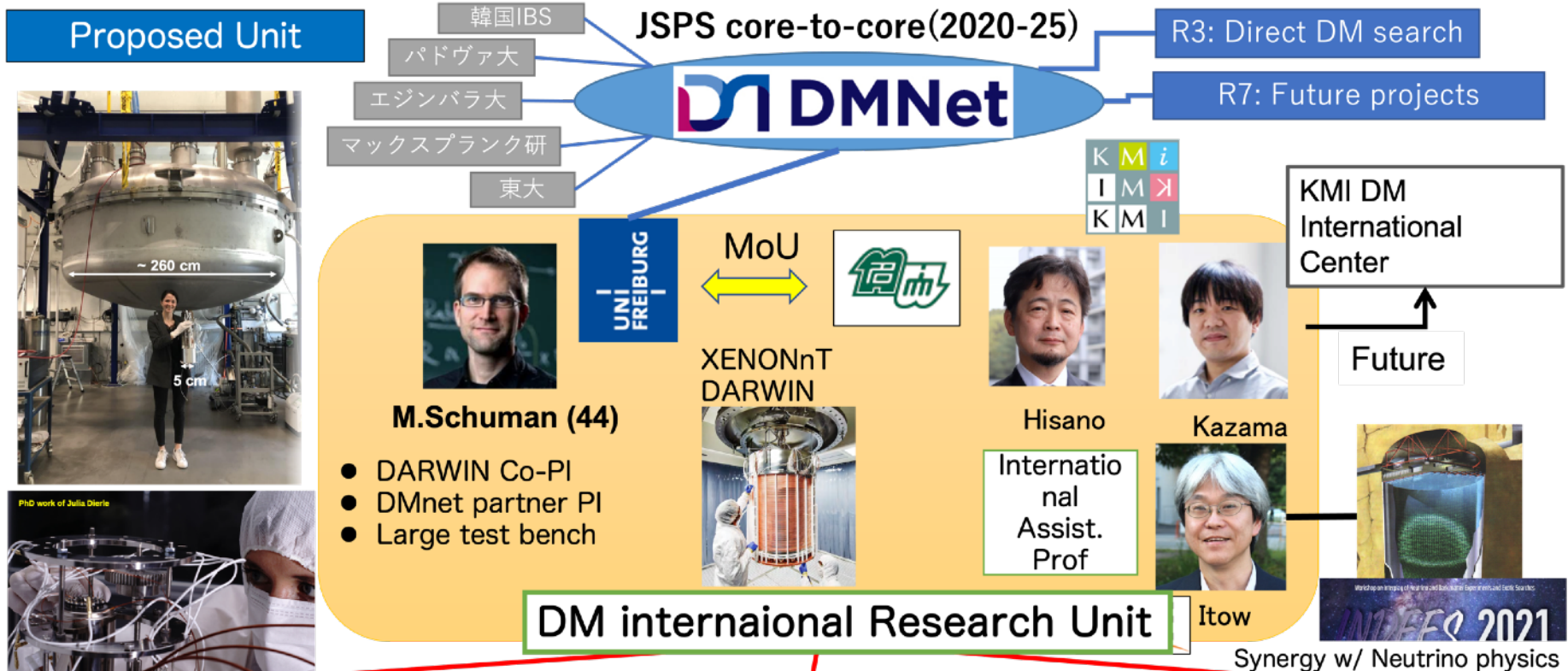
- T. Iijima: Belle II spokesman (2019.6~)
- A. Gaz: Belle II physics analysis coordinator
- P. Krizan: Belle II technical coordinator (and former spokes)
- K. Matsuoka: Belle II operation coordinator
- Y. Nakahama: ATLAS trigger coordinators
- M. Tomoto, J. Hisano, T. Iijima: leaders of grant-in-aid projects
- TOP detector, Computing at Belle II
- Trigger R&D and operation at ATLAS



Flavor Physics International Research Center
(FlaP, since 2023)

Dark Matter International Research Unit (Yoshitaka Itow)

From 2022JFY to 2026JFY



- ① LqXe technology R&D
- Hermetic TPC
 - New photo-sensors
 - Larger (50t LXe)

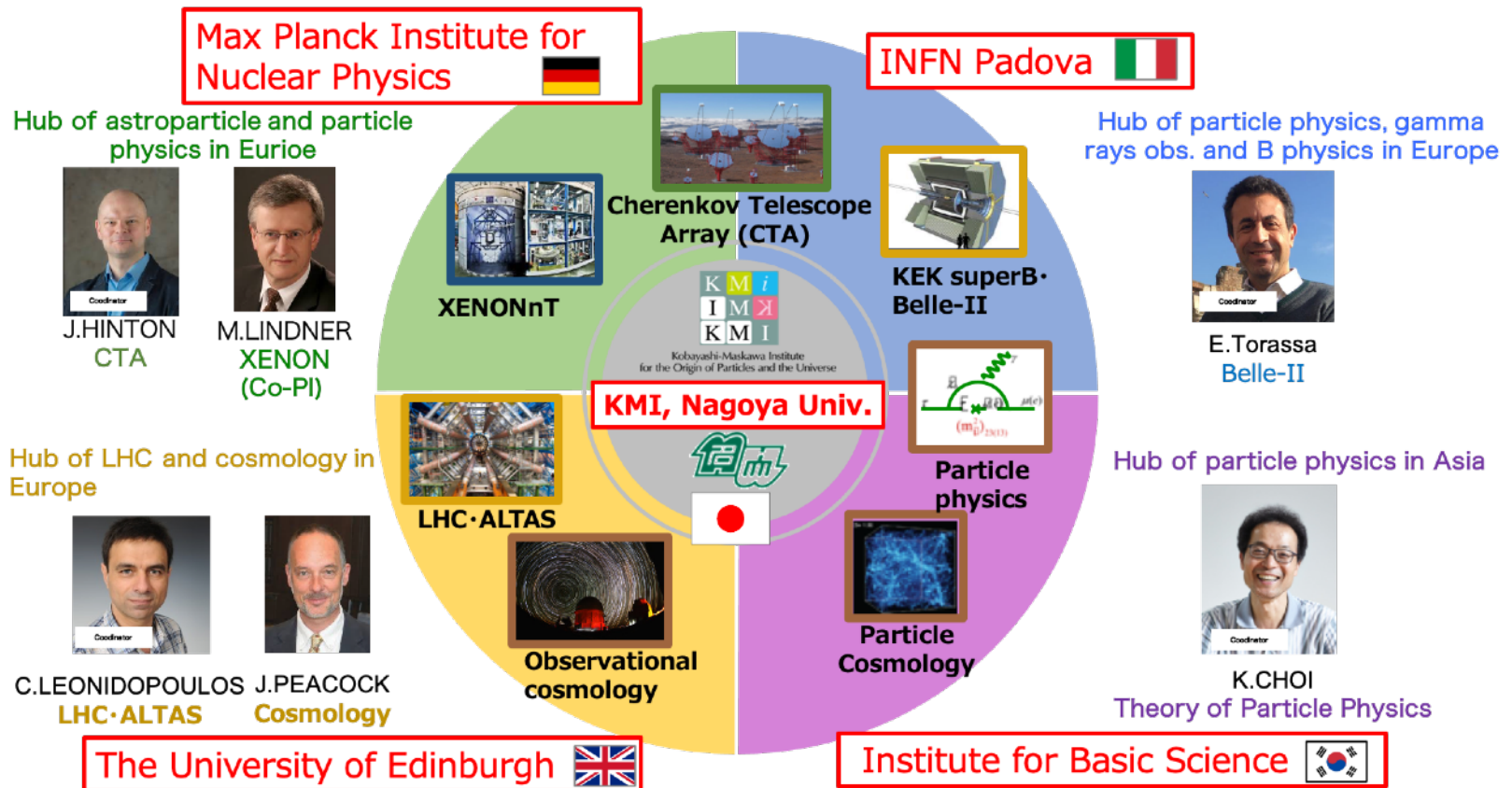
- ② Direct DM search
- XENONnT data analysis
 - Data analysis center
 - Various DM searches

- ③ Workshops
- Theory-experiment synergy
 - DM-Neutrino synergy
 - LXe technology



International research network to reveal dark matter in the universe by multidisciplinary approach in particle and astrophysics (DMNet)

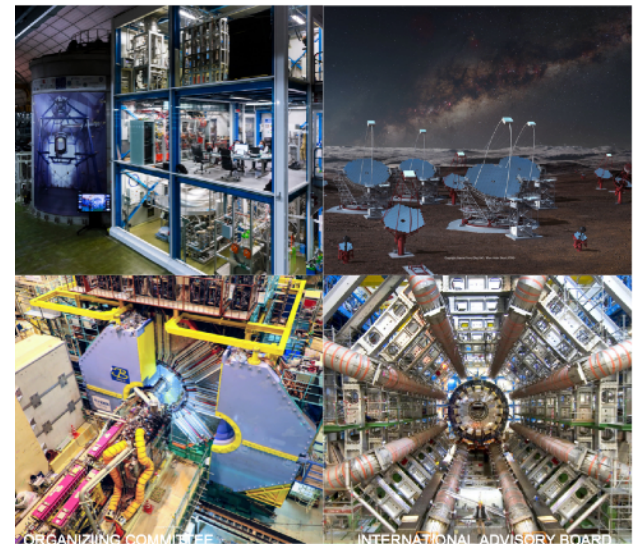
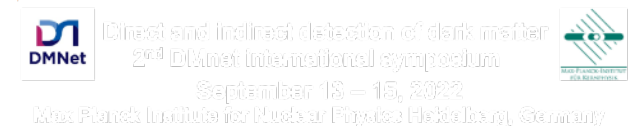
Core institute in Japan: Nagoya Univ., Coordinator in Japan : Junji Hisano



Our program

Fund of 2024JFY: 13MYen

- **Long-term overseas dispatch**
For collaborations.
Terms are longer than 1 month.
- **(Short-term) international exchange dispatch**
For presentation in seminars and international WS/conferences
Terms are about 1 week.
- **Symposiums/workshops**
2023 symposium at Padova
2024 symposium at IBS Korea





Activities

Publications and presentations



Presentations in international conferences

	2020JFY	2021JFY	2022JFY	2023JFY	2024JFY
Oral total	15	33	47	43	47
Invited	4	18	29	31	16

Refereed papers

	2020JFY	2021JFY	2022JFY	2023JFY	2024JFY
all refereed	127*	184	133*	316	257*
highly cited	11	8	9		

Highly cited paper: Ranked in top 1% articles (from Web of Science)

* # of refereed papers is relatively small in years of IAB meeting. I guess that the number is not for whole a year.

Publications and presentations



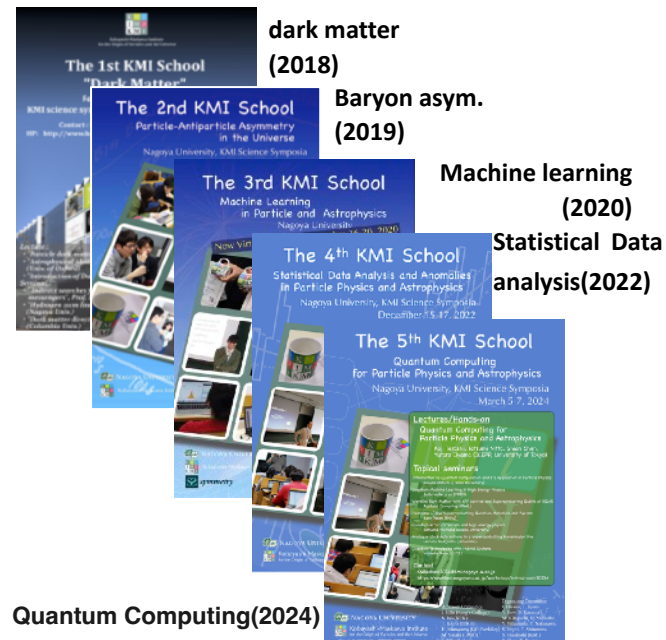
KMI : high fraction of high impact works

	Nagoya U.	Edinburgh	ITbM	KMI(19-20)	KMI(21-22)
highly cited papers	0.88% (19-22)	2.0% (19-22)	3.9% (19-22)	4.2%	5.4%
intl co-auth. papers	31.2% (Not update)	52.2% (Not update)	31.7% (Not update)	84.1%	93.1%



KMI Symposium and KMI School

- KMI Symposium (2011, 2013, 2017, 2019, 2023, 2025)
 - Bi-annual meeting ; survey physics highlights + topical hot issues
 - Showcase of KMI researches and young efforts
 - Due to COVID-19, symposium was not held on 2021
- KMI School (2018, 2019, 2020, 2022, 2024)
 - Annual school for a dedicated hot topic
 - Lectures, hands-on exercise, and seminars
 - Invite young students & PD all over the world. 20~30% of participants come from abroad.
 - **The 5th School (Quantum Computing for Particle Physics and Astrophysics) was held in Mar. 2024.**



Meetings held and sponsored by KMI



	2020FY	2021FY	2022FY	2023FY	2024FY
Held	3	3	11	4	7

International Physics School : Simon Eidelman School on Muon Dipole Moments and Hadronic Effects

2-6 Sept 2024 SCHOOL

Nagoya university, Engineering and Science Building, KMI
Asia/Tokyo timezone

Enter your search term

- Overview
- Timetable
- Contribution List
- Registration
- Scientific program
- Transportation
- Accommodation
- School site map
- Excursion
- VISA
- Code of conduct
- Poster session
- muon school LOC
- ✉ muonschool24_contact...

International Physics School : "Simon Eidelman School on Muon Dipole Moments and Hadronic Effects supported by Wilhelm and Else Heraeus Foundation" will be held at Nagoya university.

This school is intended for young researchers (master students, PhD students and young postdocs) involved in the global effort of Investigating the large excess of the measured value of the muon anomalous magnetic moment over the Standard Model prediction.



Important deadline

Registration with VISA: June 16, 2024
Registration without VISA: August 1, 2024

European and Indian students who need support for participation will be considered as candidates for support from the German Heraeus foundation if registration is completed before June 30, 2024.

Notice

Future of Artificial Intelligence for Science in Japan (FAIRS Japan 2024)

3-5 Dec 2024 WORKSHOP

Nagoya University
Asia/Tokyo timezone

Enter your search term

- Overview
- Workshop Goals
- What's "unconference"?
- Announcements
 - 1. 1st Circular
 - 2. 2nd circular
- Timetable
- Registration
- Code of Conduct
- Contact
- ✉ fairs-japan-loc@ipmu.jp

We invite you to the **Future of Artificial Intelligence for Science in Japan (FAIRS-Japan) workshop**. Our goal is to **build the AI/ML research directions in each science domain for the next 5 years**.

There have been rapid advancements in AI/ML research and their use is widely spread in science. However, the research directions and prioritization is not always clear. We believe it can immensely beneficial for the community to get together and discuss:

- Key "domain science" research challenges that are best addressed using AI/ML
- Potential/promising AI/ML techniques that can address those challenges

Logistics

- **When:** December 3rd to 5th (Tuesday - Thursday)
- **Where:** Kobayashi Masakawa Institute (KMI) at Nagoya University

Preparation

- [Register \(link\)](#)
- Submit [this form \(link\)](#) and contribute your inputs
- [Join the slack \(link\)](#) workspace

Important Dates

- Selection process for the financial aid starts: Nov. 1st 2024 (**no deadline for application, the selection process continues while the funding lasts**)
 - Update on Oct 29: the deadline for visa and financial aid is set to Nov 8th 2024.
- Registration of those who want to present a poster: Nov 30, 2024

Disclaimers

- Although there is no clear deadline for those who don't need a visa/financial support or present a poster, we will close the registration once the number of participants reaches 70.
- Our financial support is only for domestic travels due to the budget limitations.

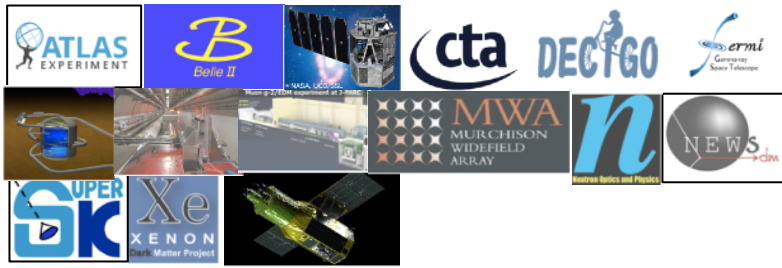


International Activities

KMI projects:
 LHC-ATLAS, Belle-II, **COSI**, CTA,
DARWIN, **DECIGO**, **DsTau**, **Euclid**,
FASER, Fermi, **FORCE**, **GRAINE**,
 Hyper-K, **HSC**, LHCf/RHICf, Muon g-2/
 EDM, MWA, **Nancy Grace Roman**,
 NEWSdm, NOP, SuperK, **Vera C Rubin**,
 XENON, XRISM, **Magic**
25 projects (12 joined aft 2021)

Agreement Institutions
 (8 Institutes now)
 Yonsei Univ. (Korea)
 KITPC/CAS (China)
 Higgs Center (UK)
 Joseph Stefan Inst. (Slovenija)
 Tel Aviv Univ. (Israel)
 IEEC (Spain)
 INFN Padva (Italy)
 INFN Napoli (Italy)

Core-to-Core program
 (2020-2024)
 Univ. of Edinburgh, MPI for
 physics, INFN Padova, IBS



KMI Visitors

	2020JFY	2021JFY	2022JFY	2023JFY	2024JFY
Total	0*	3	13	13	22

(*: due to COVID-19)

Seminars and Colloquia



Colloquium: Invitation of lecturers from outside
KMI Topics: Report on activities by KMI members
Both of them are for both of theorists and
experimentalists

	2020JFY	2021JFY	2022JFY	2023JFY	2024JFY
Seminar	5	1	3	7	13
KMI Topics	4	5	5	3	4
KMI Colloquium	5	9	6	8	6

(*) tentative

Need doubly check the numbers

Establishment of Flavor Physics International Research Center in April 2023



- We made budget request to MEXT for establishment of Flavor Physics International Research Center, which is a part of the successive budget requests of Nagoya University Institute for Advanced Studies (NAIAS). It is approved. Budgets for salary of researchers and projects will come to KMI in 2023FY.
- The budget will continue until 2026FY. If KPI (# of top 1% papers and of international collaboration papers) is satisfied at the end of 2026FY, the budget will become indefinite.
- We also had a plan for next budget request to MEXT for establishment of DM International Research Center in KMI in 2025. It is based on achievements of the core-to-core program “DMNet” and Dark Matter International Research Unit (Itow-san’s project).
 - The budget request to MEXT was turned down unfortunately.

Two major agenda in KMI

- Missing anti-matter → Flavor physics and CP violation

Successfully funded by MEXT

FlaP (2023-)

- Dark Matter and Dark Energy

JSPS Core-to-Core Program
DMnet (2020-2024)

- Create research network
- Support long-term stays of young researchers

Nagoya U. WPI-next unit*)
DMunit (2022-2024)

- R&D future liquid Xe technology
- Synergy of underground experiment for dark matter and neutrinos

Started by KMI internal resource
(unsuccessful funding application for 2025)

DarMa (2025-)

Extended 2025-26

*) WPI-next unit: Cutting-Edge International Research Unit promoted by Nagoya U.

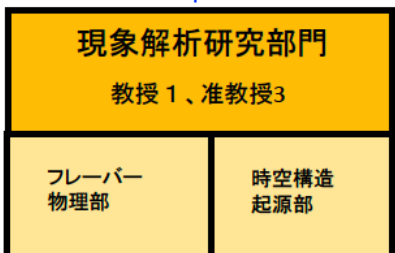
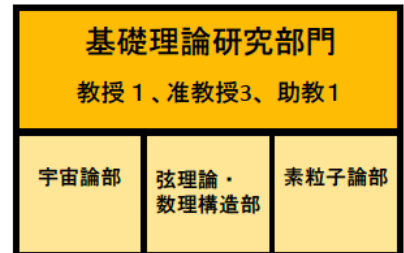
新・旧組織図

旧組織

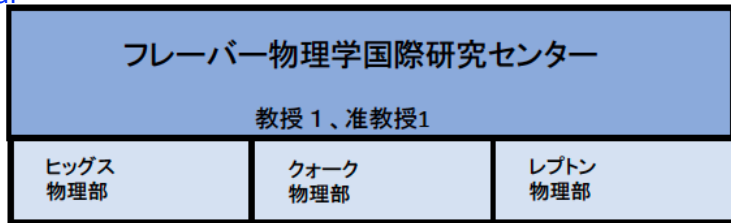
素粒子宇宙起源研究所 (KMI)

Division of Theoretical Studies

Division of Experimental Studies



FlaP

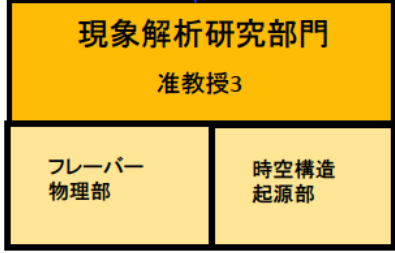
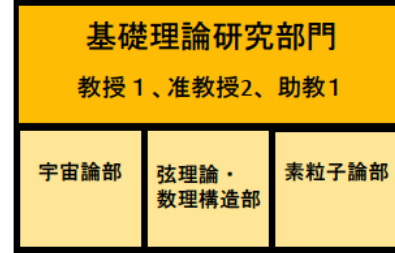


新組織

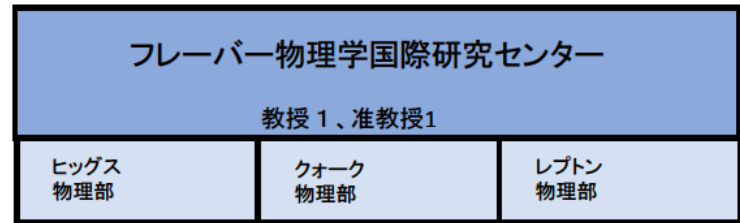
素粒子宇宙起源研究所 (KMI)

Division of Theoretical Studies

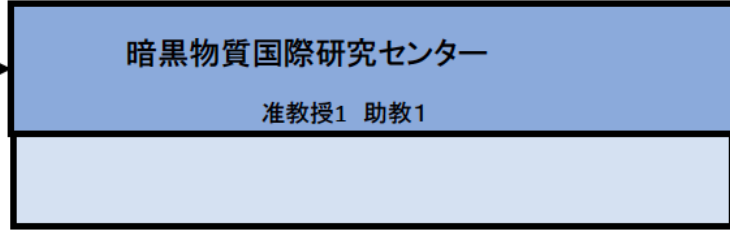
Division of Experimental Studies



FlaP



DarMa



准教授1、助教1
(KMI内異動)

Job opening for a non-Japanese associate professor

- Supported by NU's plan to double the number of foreign researchers (assistant professor level, no term-limited)
- We decided to make a associate professor position by topping money from our budget.
- The initial term of the position is 4 years after the start of employment. If one is successful in the evaluation which will be conducted during the third year, the position will be converted to an associate professor without the limited term period from the fourth year.

The successful candidate is expected to collaborate with researchers in the KMI to conduct world-leading research in the relevant fields and to develop interdisciplinary areas across the fields. The candidate is expected to develop a technical core such as AI/Machine Learning, quantum computing, and/or advanced detector technology, to lead future cutting-edge KMI science.

- The selection process is in progress and to be concluded soon.

Prospect & Concern

- The budget size of KMI became significantly larger since 2023 thanks to the successful funding request for FlaP. It is essentially important that the FlaP budget is converted to a consecutive funding.
 - If this is done, we may create non term-limited positions which can be handled by ourselves to promote unique and independent research at KMI.
- DarMa will be started by KMI internal resource + external funding
 - How to follow up DMNet activities?
- More international connections
 - Non Japanese associate professor
 - Cross appointed professors
 - Mark Hartz w/TRIUMF + one more?
 - Tighter connections w/ some foreign institutes
 - Edinburgh, ...
- Gender valance is not good in KMI now.
- Smooth generational change for future leadership

Grant-in-Aid for World-Leading Research
(国際先導研究) may be useful.