Progress Status
on the CRC Future Plans Roadmap
（CRC将来計画ロードマップの進捗状況）

Chief executive of the **CRC**
Faculty of Engineering, Kanagawa University
Kinya Hibino

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1. What is CRC?
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3. Discussions and results on Future Academic Advancement Initiative (未来の学術振興構想） 2023 and 2026
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What is CRC?
CRCとは？

CRC = Cosmic ray Researchers Congress (established in 1953)
= Community of the researchers who are working/interested in cosmic ray physics, astroparticle physics, and astrophysics in Japan.

Purpose: Contributing to the development of cosmic ray physics through encouraging cooperations and interactions among researchers.

Activity: Planning and management of conferences/workshops for related studies and future plans.

Organization: General meeting twice a year.
Executive board by 13 elected board members

Number of members: 384 @ May 2025

CRC future plan committee
CRC将来検討小委員会

A permanent standing committee for continued discussions of future plans.

Established in 2011

Members: about 12 including non-CRC members invited
from other communities(Astronomy, Particle physics, etc.)
Selected by the CRC executive board
5th term (Apr. 2022 - Mar. 2024)
Currently, 6th term (Apr. 2024 - Mar. 2026)

Activity: Planning and management of the conferences called “CRC town meeting for future plans”. Moreover, **discussing and priority rating of proposed future plans** for the most recent Future Academic Advancement Initiative （未来の学術振興構想） based on the discussions in the town meetings.

Town Meeting: about twice per year, ~60 participants. In total 23 meetings.

The CRC Future Plan Committee 2021

Charparson

Takayuki Tomaru (NAOJ)

Committee Members

Yoshiki Tsunesada (Osaka City University)
Hidetoshi Kubo (Kyoto University)
Takashi Sako (University of Tokyo, ICRR)
Yasuno Ishihara (Chiba University)
Kentaro Miuchi (Kobe University)
Hideyuki Fuke (ISAS)
Hiroaki Menjo (Nagoya University, ISEE)
Takaaki Tanaka (Konan University)
Katsuaki Asano (University of Tokyo, ICRR)
Naoki Yoshida (University of Tokyo)
Shigetaka Matsumoto (University of Tokyo, IPMU)
Kohei Yorita (Waseda University)

Observers

Yoshitaka Ito (Nagoya University, Former Chair)
Masayuki Nakahata (University of Tokyo, ICRR; Science Council of Japan Cooperative Member)
Takaaki Kajita (University of Tokyo, ICRR; President of the Science Council of Japan)

委員長

都丸隆行（国立天文台）

委員

常定芳基（大阪市大）
窪秀利（京大）
さこ隆志（東大ICRR）
石原安野（千葉大）
身内賢太朗（神戸大）
福家英之（ISAS）
毛受弘彰（名大ISEE）
田中孝明（甲南大、外部）
浅野勝晃（東大ICRR）
吉田直紀（東大、外部）
松本重貴（東大IPMU、外部）
寄田浩平（早稲田大）

オブザーバー

伊藤好孝（名大、前委員長）
中畑雅行（東大ICRR、学術会議連携委員）
梶田隆章（東大ICRR、学術会議会長）

Results on the Future Academic Advancement Initiative （未来の学術振興構想） **2023**

- The three new projects are to be given top priority, and their recommended rankings will remain unchanged from the 2021 recommendations.

- **KamLAND-2 and IceCube-Gen2 (1st priority), B-DECIGO (3rd priority)**

- The three current projects (**CTA, KAGRA, Hyper-Kamiokande**) will be explicitly designated as top priority projects.

- The four projects proposed in 2021 as medium-sized B projects and also submitted for the Future Academic Promotion Plan (**DARWIN, Mega ALPACA, UHECR-TA2 (GCOS), POEMMA**) will be newly recommended as medium-sized A projects.

Future Academic Advancement Initiative 2023

未来の学術振興構想2023

The 2023 edition consists of 19 grand visions.

	Grand Vision Title
1	Presentation of solutions through data analysis of modern social problems based on the enrichment of language and communication research
2	The science of humans and society from a long time axis, a large spatial axis, and diverse perspectives
3	Reconstruction of non-Western history, including Japanese history, and international collaboration
4	Academic creation to sustain the earth's life environment and food supply
5	Creating true Well-being through a comprehensive understanding of life phenomena
6	New developments in life sciences driven by big data
7	Academic creation to know, create, and utilize human intelligence
8	Human Capacity Expansion and Symbiosis with AI in a super-smart society
9	Value creation through the construction and utilization of cyberspace
10	Restructuring the academic community through data infrastructure and utilization
11	A future society pioneered by mathematics, mathematical science, and quantum information science
12	Understanding the Earth system through observational technology innovation and development into global change prediction
13	Building a sustainable society that is resilient to global environmental crises
14	Solving the problem of energy and environment balance
15	Development of innovative materials and materials that contribute to a sustainable society
16	Elucidation of the extreme world using quantum beams and contribution to human society
17	Promotion of solar system exploration and expansion of human frontiers
18	宇宙における天体と生命の誕生・共進化の解明
19	自然界の基本法則と宇宙・物質の起源の探求

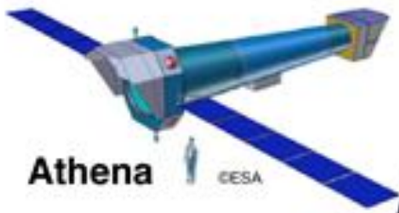
The plans recommended by the CRC were adopted in the Grand Vision (green) for no.18 and no.19.

Grand Vision 18: Elucidation of the birth and coevolution of celestial bodies and life in the universe

- **How stars, galaxies, and planets are born,**
- **How they change together,**
- **And how life in the universe may begin.**

Ultra-high energy
Gamma rays and cosmic rays

Cherenkov Telescope Array
Mega ALPACA
Global Cosmic-ray Observatory



ブラックホール

パルサー

宇宙初期

星や惑星の原料であるガスや塵

星と惑星と生命の誕生

電波・可視光赤外線・紫外線

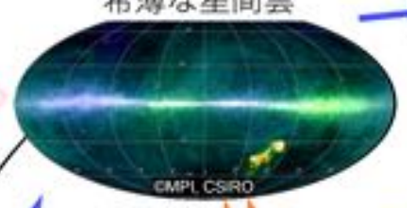
ニュートリノ・宇宙線・重力波・ガンマ線・X線

星の最期

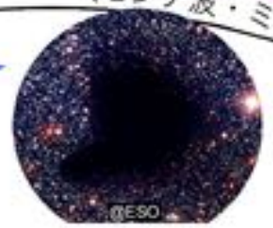
超高温・高エネルギーの現象

宇宙の成長期

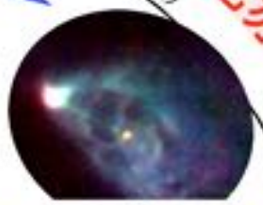
希薄な星間雲



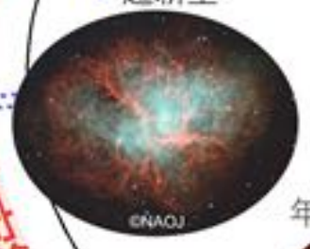
（センチ波・ミリ波・サブミリ波）



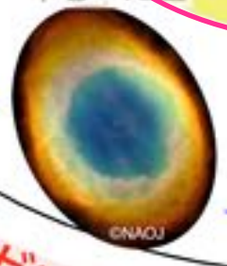
星間分子雲


原始星
原始惑星系

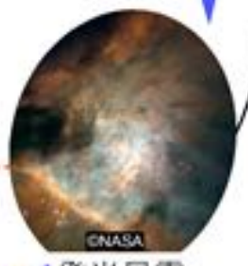
超新星



年老いた星



若い星



発光星雲

太陽系外惑星
生命

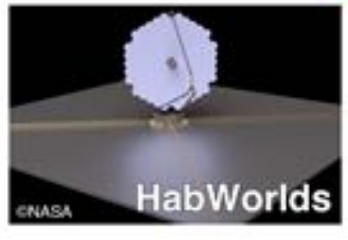
宇宙における
天体と生命の
誕生と共進化
の解明

学際的発展
マルチメッセンジャー天文学
アストロバイオロジー

- 宇宙再電離の起源の解明
- 宇宙における第一世代天体の発見
- ガンマ線バーストの解明
- 巨大ブラックホールの形成と銀河との共進化
- 星・惑星形成過程の解明
- 高エネルギー宇宙線の起源
- 太陽系外惑星の大気分光とバイオシグニチャーの探査

Space and telescope
(Infrared position astronomy
X-rays, gamma rays, ultraviolet rays
• VISIBLE LIGHT INFRARED)

Jasmine, LAPYUTA, Athena,
Habaitable Worlds Obserbatory
Interplanetary Space Telescope
HiZ-GUNDAM, POEMMA
GREX-PLUS, FORCE



複数の地上・宇宙望遠鏡を組み合わせた多波長国際共同観測

Large terrestrial general-purpose telescope (radio waves • visible light infrared)
Thirty Meter Telescope
Square Kilometer Array
ngVLA, 国際南極天文台
Large Submillimeter Telescope

The green frame indicates plans recommended by the CRC.

Grand Vision 19: A Quest on the Basic Laws of Nature and the Origins of the Universe and Matter

The basic laws of nature
Exploration of the origin of the universe

- **What is the universe made of?**
- **How did it begin?**
- **What are the laws behind everything?**

高エネルギー加速器を用いた素粒子・原子核実験

LHC（HL-LHC）におけるATLAS実験，FASER/FPF計画
SuperKEKBにおけるBelle II実験
J-PARCにおけるフレーバー素粒子実験

J-PARCにおけるハイパー核実験、ハドロン物理実験
海外施設におけるQCD研究(GSI，BNL，CERN)
スパコンによる第一原理計算

重力波を用いた重力理論の検証と重力波宇宙物理学

地上重力波天文台　**KAGRA**
スペース重力波天文　**B-DECIGO**

自然界の基本法則と宇宙の起源の探求

宇宙マイクロ波背景放射中の背景重力波信号探査とインフレーション理論の検証

スペース探査機　“LiteBird”
地上望遠鏡群　“Simons Observatory”

ニュートリノ質量の決定とニュートリノ宇宙物理学

南極
アイスキューブ実験
IceCube

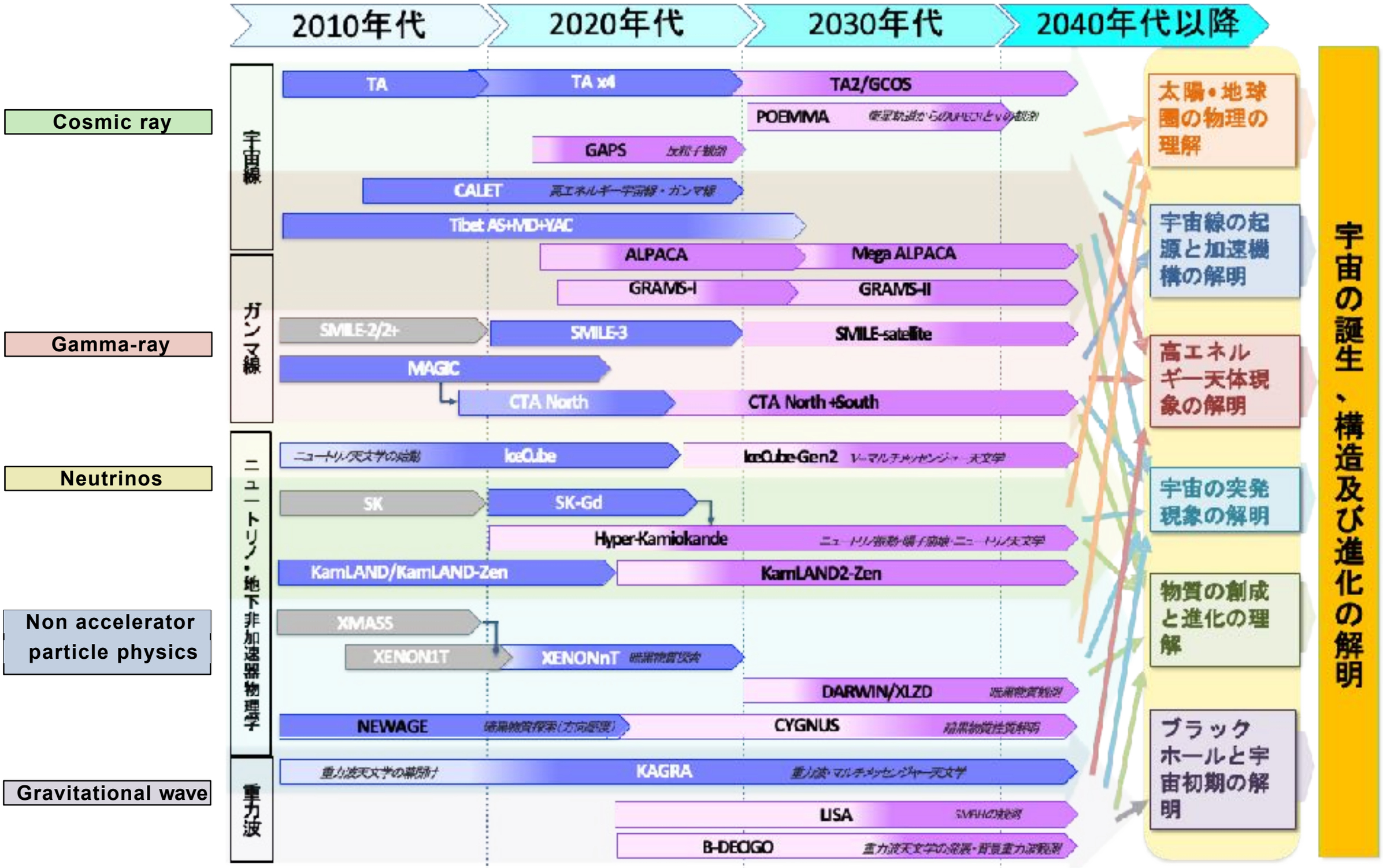
地下実験によるダークマター検出と新現象探索

陽子崩壊実験
DARWIN/XLZD実験
DARWIN /XLZD

Hyper-Kamiokande
Kamland2

The green frame indicates plans recommended by the CRC.

Update: CRC Roadmap (2023)



Up to here is 2023.

From here on is 2024 and beyond.

The New CRC Future Plan Committee

Chairperson

Kentarō Miuchi (Kobe University, Retained)

Committee Members

Yasuno Ishihara (Chiba University, Retained)
Hideyuki Fukue (ISAS, Retained)
Hiroaki Menjo (Nagoya University ISEE, Retained)
Yoichi Aso (ICRR)
Hirofumi Noda (Tohoku University, External)
Nagisa Hiroshima (Yokohama National University)
Kiyoyoshi Ichiki (Nagoya University, External)
Toshihiro Fujii (Kobe University)
Kazumasa Kawata (ICRR)
Yusuke Suda (Hiroshima Univ., External)
Ken Sakashita (KEK, External)

Observers

Takayuki Tomaru (NAOJ, Former Chair)
Shoichi Ogio (ICRR)
Yoshitaka Ito (ICRR, Retained)
Takaaki Kajita (ICRR, Retained)

委員長

身内賢太朗（神戸大　留任）

委員

石原安野　（千葉大　留任）
福家英之　（ISAS　留任）
毛受弘彰　（名大ISEE　留任）
麻生洋一　（国立天文台→ICRR）
野田博文　（東北大　外部）
廣島渚　（横国大）
市來淨與　（名大　外部）
藤井俊博　（大公大）
川田和正　（ICRR）
須田祐介　（広島大　外部）
坂下健　（KEK　外部）

オブザーバー

都丸隆行　（国立天文台　前委員長）
荻尾彰一　（ICRR）
伊藤好孝　（名大ISEE→ICRR　留任）
梶田隆章　（ICRR　留任）

The Missions of the New CRC Future Plan Committee

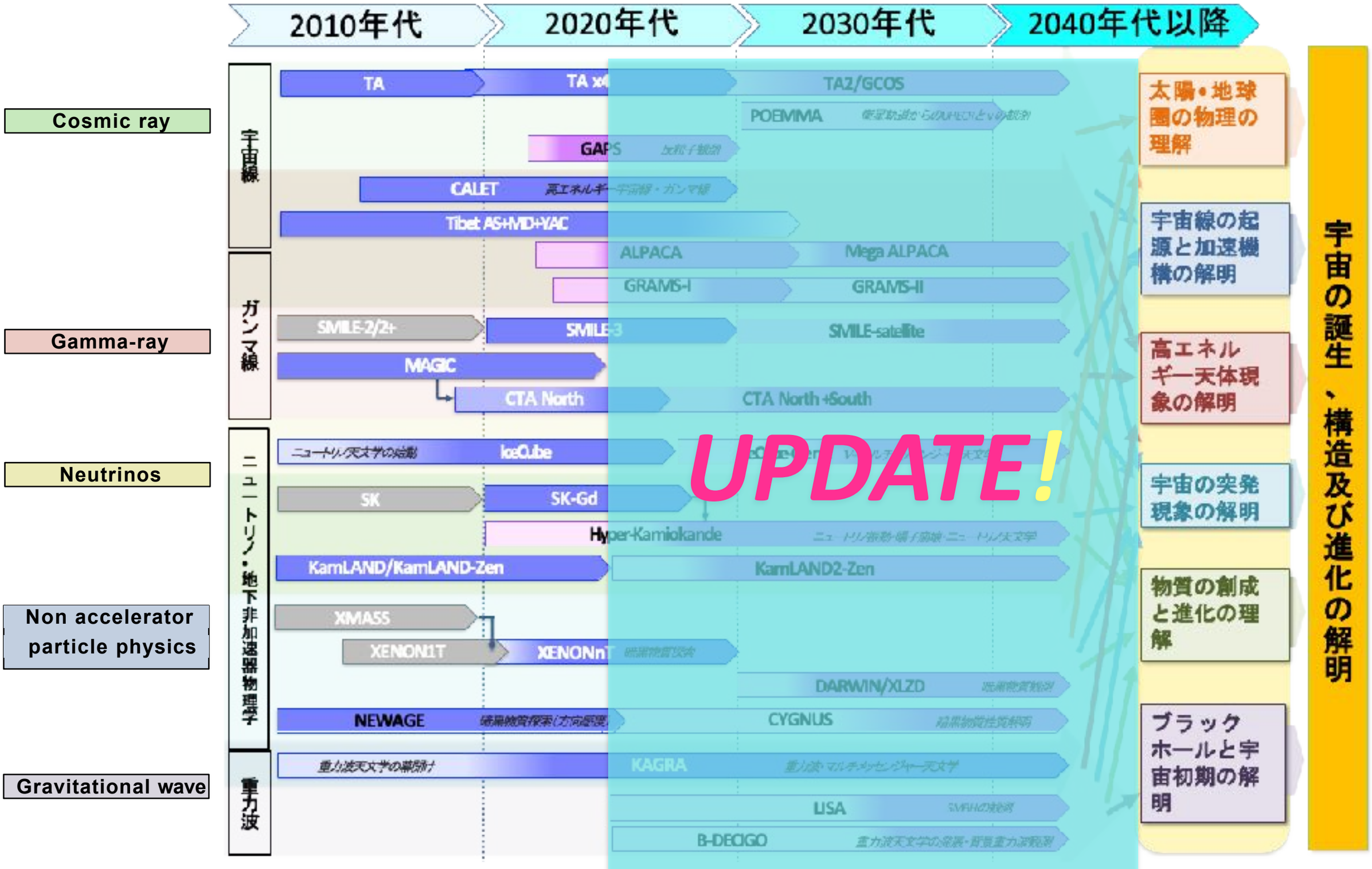
- **Update for CRC Roadmap**

  ➡Conduct discussions with a view toward the next 10 to 30 years.

- **Discussions on Future Academic Advancement Initiative (未来の学術振興構想) 2026**

  ➡Suggestions to the CRC community

Update for CRC Roadmap (2023→2026)



Schedule for Update

Future Academic Advancement Initiative (未来の学術振興構想) 2026

Goal

Community

Submitting each proposal

Suggestions from the CRC

CRC

Cosmic Ray - Related Workshops

Update for CRC Roadmap

Town Meeting

Town Meeting

Town Meeting

2025

2026

2027

Cosmic Ray - Related Workshops

1. 高エネルギー天体現象

Speaker: Kazumi Kashiyama (Tohoku University)

2. 宇宙線の起源と加速機構の解明

Speaker: Jiro Shimoda (ICRR, University of Tokyo)

3. 銀河・大規模構造の進化

Speaker: 広直 宮武

4. 宇宙線のモジュレーション

Speaker: Kazuoki Munakata

5. 超新星のマルチメッセンジャー試み

Speaker: Prof. 堀内 俊作

6. 宇宙初期・物質の創成

Speaker: Kaz Kohri (KEK / Sokendai / Kavli IPMU)

7. 雷や雷雲からの放射線と宇宙線

Speaker: Harufumi Tsuchiya (Japan Atomic Energy Agency)

未来の学術振興構想2026申請リスト

- **ハイパーカミオカンデ**（前回既存推薦計画）
- 大型液体キセノンを用いた宇宙暗黒物質直接検出実験
  （**DARWIN/XLZD** 実験計画の推進）（前回推薦中型計画）
- **カムランド**高性能化による極低放射能環境でのニュートリノ研究
  （前回新規1位推薦）
- **CTAO国際宇宙ガンマ線天文台**（前回既存推薦計画）
- **大型低温重力波望遠鏡 KAGRA 計画** (略称: KAGRA)（前回既存推薦計画）
- **GCOS**（前回推薦中型計画）
- **宇宙重力波望遠鏡B-DECIGO**（前回新規3位推薦）
- **Mega ALPACA構想**（前回推薦中型計画）
- FASER実験/Forward Physics Facility計画（高エネから推薦）
- **IceCube-Gen2**（前回新規1位推薦）

Summary

- The CRC contributes to the development of cosmic ray physics through encouraging cooperation and interactions among researchers.

FY2021-2023

- The CRC recommended three new plans in order of priority in the Future Academic Advancement Initiative 2023, and all three were accepted (KamLAND-2, IceCube-Gen2, B-DECIGO).
- In addition, three existing plans were recommended and accepted (CTA, KAGRA, Hyper-Kamiokande).
- Furthermore, four medium-scale plans were recommended and accepted (DARWIN/XLZD, Mega ALPACA, UHECR-TA2 (GCOS), PEOMMA).

(Names shown in red are ICRR projects)

FY2024-2026

- **We are currently discussing the next round for 2026.**

Comments on the NAOJ Science Roadmap

- The seven CRC-recommended projects — **Hyper-Kamiokande, CTAO, KAGRA, GCOS, B-DECIGO, Mega-ALPACA, IceCube-Gen2** — are all closely connected to NAOJ.

- These projects will lead in **multi-messenger astronomy,** enabling collaboration across gravitational waves, neutrinos, gamma rays, cosmic rays, and electromagnetic observations.

- **KAGRA**, which has a formal cooperation agreement with ICRR, is a key gravitational-wave facility. **We hope NAOJ will further enhance its support for KAGRA.**

- Looking to the future, **B-DECIGO** will be essential for space-based gravitational-wave astronomy, and **we hope NAOJ will actively promote and support its plan.**

Thank you very much for your attention.

If time allows, I would be happy to answer questions (日本語？).