TAKING INNOVATION ABROAD:
Bridging Borders for Technology Transfer in Germany and Japan
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JST's Promotion of Technology Transfer and International Cooperation

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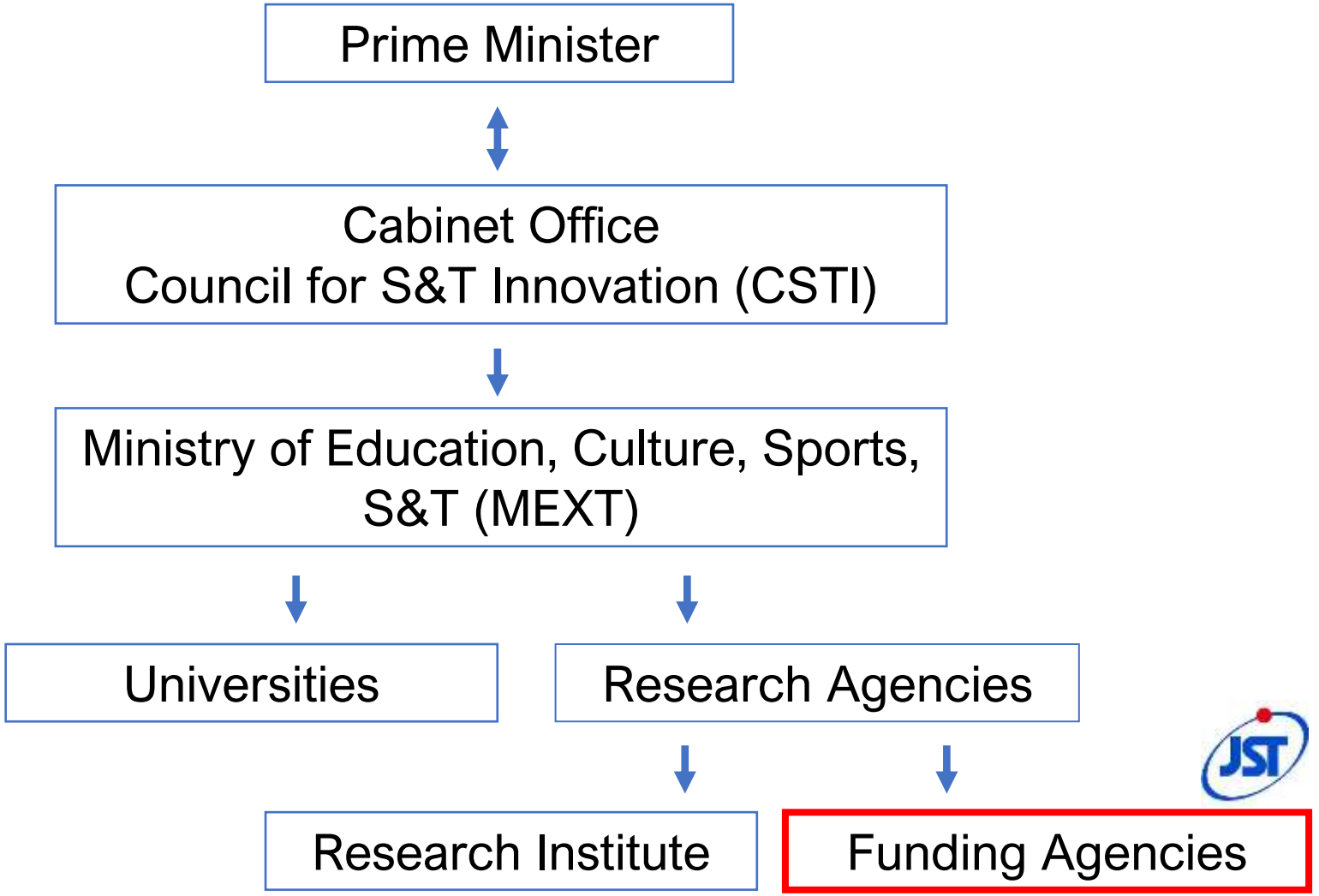
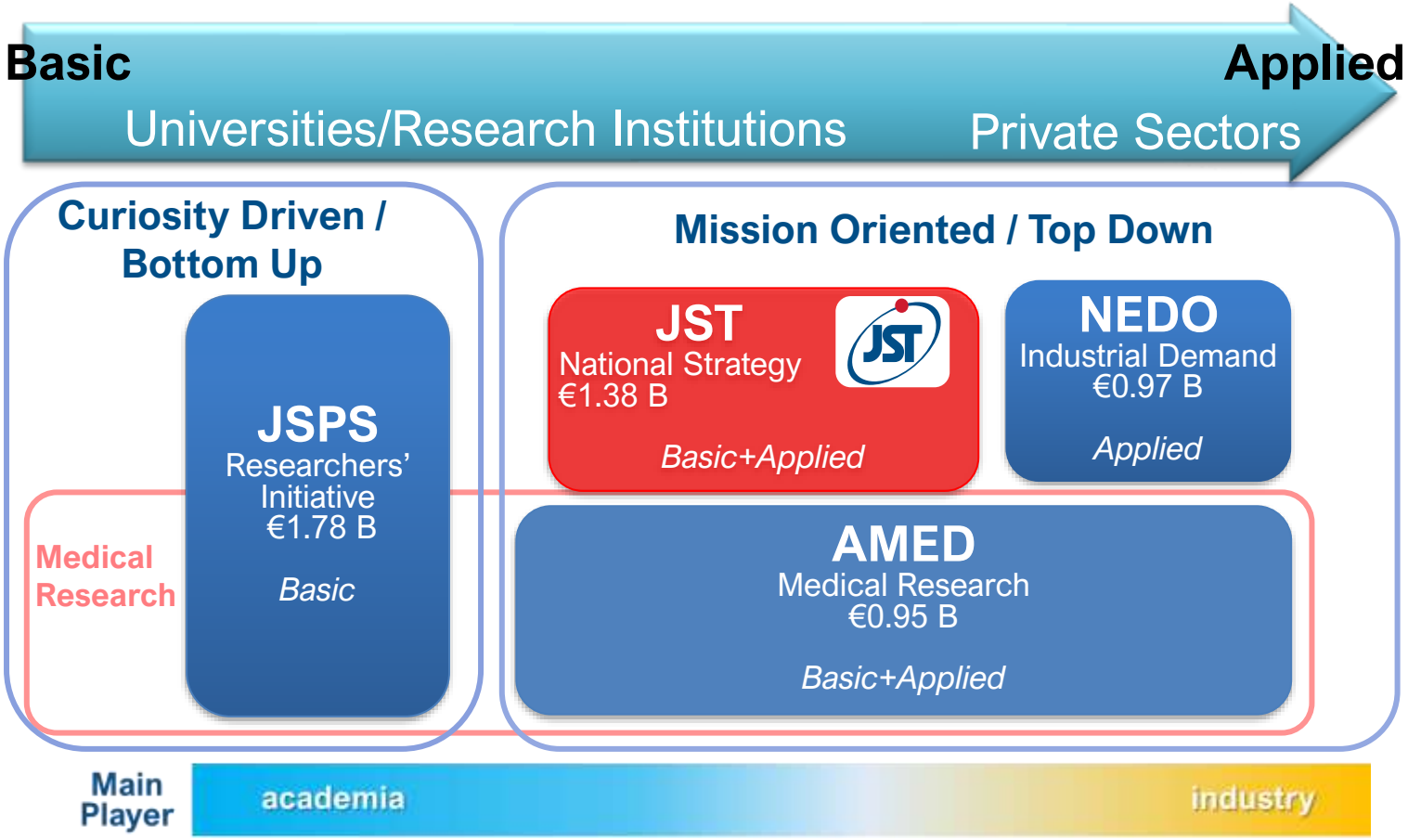
1. Introduction

STI Framework in Japan



Funding Agencies Mapping in Japan



FY2023 initial budget, €1:JPY158

Integrated Innovation Strategy 2023

What is Integrated Innovation Strategy?

National strategy for science, technology and innovation drafted and annually updated by Cabinet Office

Major Challenges in 2023 version

- Rapid changes of international situation (e.g. severity of energy and food, importance of supply chains, post-COVID, AI development…)
- Relative decline in Japan's research capabilities

Three cornerstones in 2023 version

1. Strategic promotion of Advanced Science and Technology (e.g. Semiconductors, biotech, materials…)

2. Enhancement of Knowledge bases (research capabilities) and Human Resource Development

→Promotion of international joint research and brain circulation

3. Creation of Innovation Ecosystem

→Promotion of Start-up creation and industry-academia collaboration

JST's Missions

- **Supporting transformative research** that generates scientific knowledge and an impactful value for global society
- **Promoting technology transfer** as a bridge between academia and industry

2. Technology Transfer

Major Policy Development in Japan

1995: Enactment of Basic Act on Science and Technology
National recognition of S&T as a driver for socioeconomic development and improvement of the national welfare

1998: Act on the Promotion of Technology Transfer from Universities to Private Business Operators
Approvals and Supports for TLOs

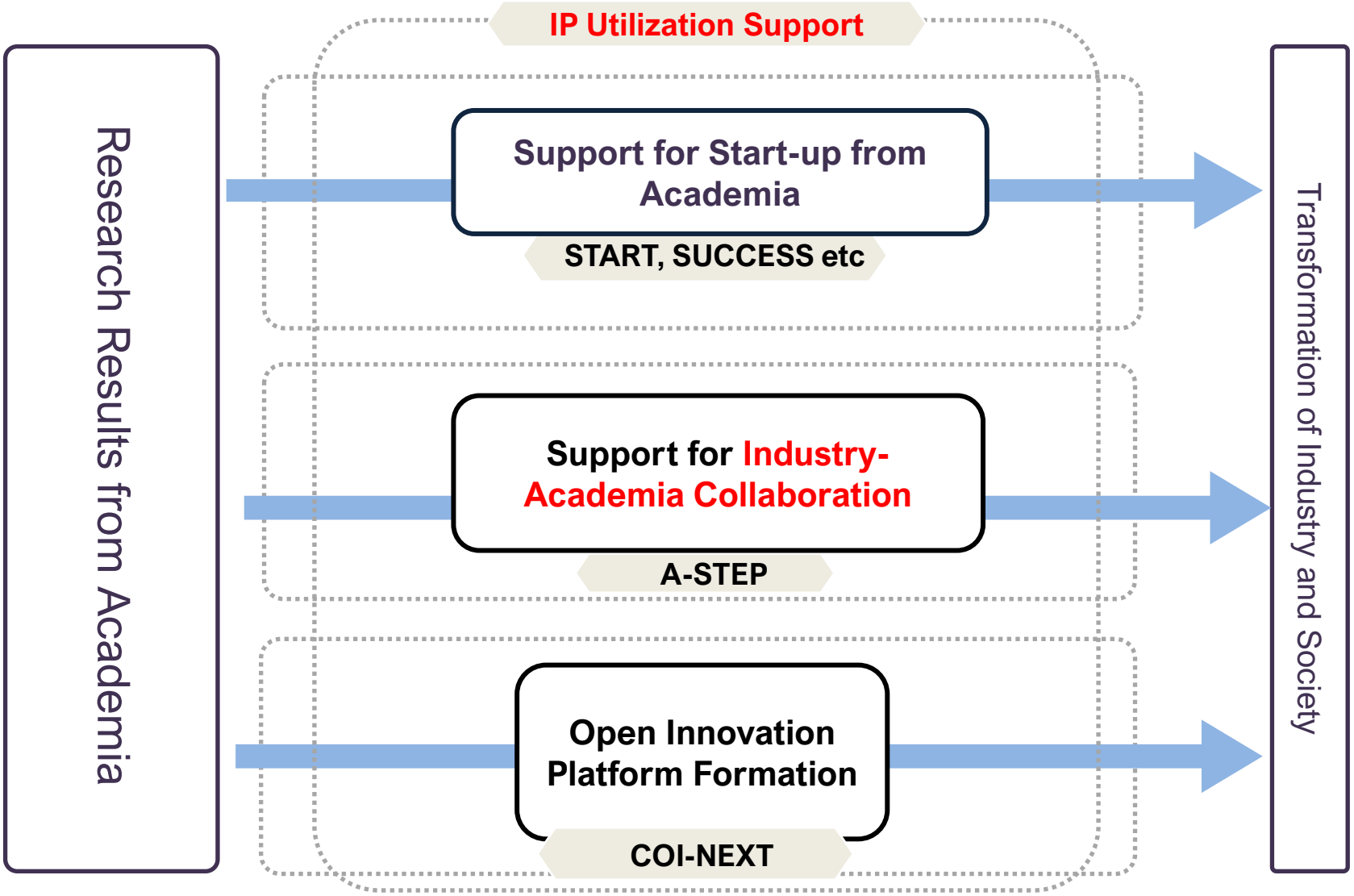
1999: Act on Special Measures for Industrial Revitalization (Japanese Bayh-Dole Act)
Results of national contract research belongs to contractors

2004: Incorporation of National Universities
Acquisition of corporate status, investment in approved TLOs, institutional ownership of patents etc

2006: Amendment of the Basic Act on Education
“Contribution to society (including university-industry collaboration)” added to missions of universities

2021: Amendment of Basic Act on Science and Technology
“Creation of innovation” added to the subject of the Act

Pathways towards Commercialization in JST



Programs and Budget

Program		FY2023 Million JPY (EURO)
Support for Start-up from Academia	Program for Creating Start-ups from Advanced Research and Technology (START)	2,039 (13.6)
	Support Program of Capital Contribution to Early-Stage Companies (SUCCESS)	2,500 (16.7)
Support for Technology Transfer	Adaptable and Seamless Technology Transfer Program through Target-Driven R&D (A-STEP)	4,964 (33.1)
Platform Formation	Program on Open Innovation Platform for Industry-Academia Co-Creation (COI-NEXT)	13,751 (91.7)

In addition, a fund of 98.8 billion JPY (658.7 million EURO) for strengthening university-launched startups has been newly created at JST in March 2023.

Success Story I: Commercialization of Blue LED

Invention and commercialization of GaN Blue LED

1986～1990: **JST's funding** to Prof. Akasaki's team and Toyoda Gosei Co., Ltd (Industry-Academia)

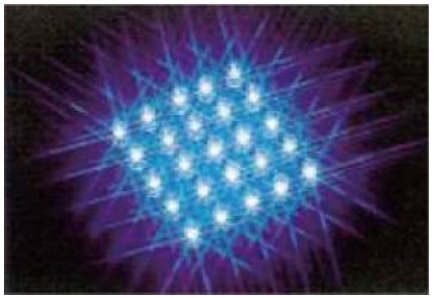
→ **Invention of GaN Blue LED** (1989)

1995: **Commercialization**

2014: **Novel Prize of Physics**

Prof. AKASAKI Isamu

Prof. AMANO Hiroshi



Blue LED

Nobel Prize in 2014

Potential Impact

- Potentially **USD 300 billion** LED Market in 2030*
- Key technology toward **Carbon Neutrality**
  LED lighting: contributing to significant energy reduction

LED lighting

https://industrytoday.com/led-lighting-its-function-and-advantages/

*fortune Business Insights: https://www.fortunebusinessinsights.com/led-lighting-market-106832

Success Story II: Revolution in Flat Panel Displays

Invention and commercialization of IGZO-TFT (InGaZnO)

1999～2010: **JST's funding** to Prof. Hosono's team (Basic Research)

→ **IGZO-TFT published** on Science (2003), Nature (2004)

The devices essential for the manufacturing of large-scale Organic Light-Emitting Diode (OLED) displays.

→ **JST packaged a group of patents** for the research results

→ 2011: **Licensed to Samsung**

Prof. HOSONO Hideo
Japan Prize 2016

IGZO-TFT

Commercialization of IGZO-TFT worldwide

- The patents have been **licensed worldwide**
- Having **used in major electric devices** such as smartphones, PCs, and TVs

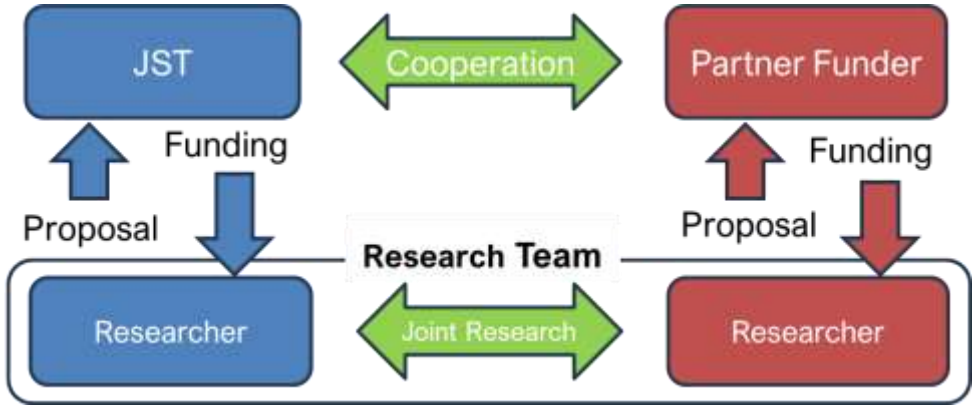
Source: https://www.titech.ac.jp/news/2018/041884

3. “2+2” International Cooperation

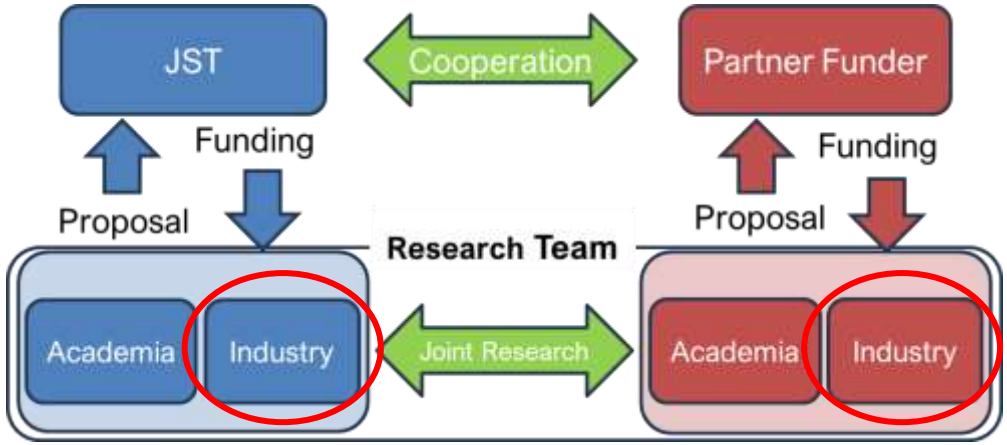
What is “2+2” Collaborative Research Scheme?

International academic-industrial partnered research development through 4-member Japanese and counterpart country’s academia and industry research teams

- **Conventional Scheme for international matching fund**



- **Scheme for “2+2” international matching fund**



“2+2” International Cooperation

Why is “2+2” important?

- 2+2 pools knowledge, experience, research infrastructures and other resources of the four partners that generates synergic effect for innovation
- 2+2 provides the long-term basis for mutual market access and lasting economic cooperation

Effective way to drive R&D towards commercialization

The government will promote the strategic development of science and technology diplomacy through … the fundamental strengthening of support for international industry-academia joint research with a view to implementing the results in society …

“The 6th Science, Technology, and Innovation Basic Plan”
Chapter 2, 1., (6) , 3) , ④ Strategic promotion of science and technology diplomacy

JST's experience in "2+2"

Vinnova – JST (2016 – 2022)

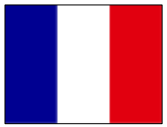
- Innovative solutions, community design and services for elderly people (FY2016 -18 Phase1, FY2019 -22 Phase2)

BMBF – JST (2017 -)

- Optics Photonics I (FY2018 -)
- Optics Photonics II (FY2020 -)
- Hydrogen Technologies (FY2022 -)

NRC – JST (2022 -)

- AI-based solutions for well-being, better living environments, and social connection for aging populations

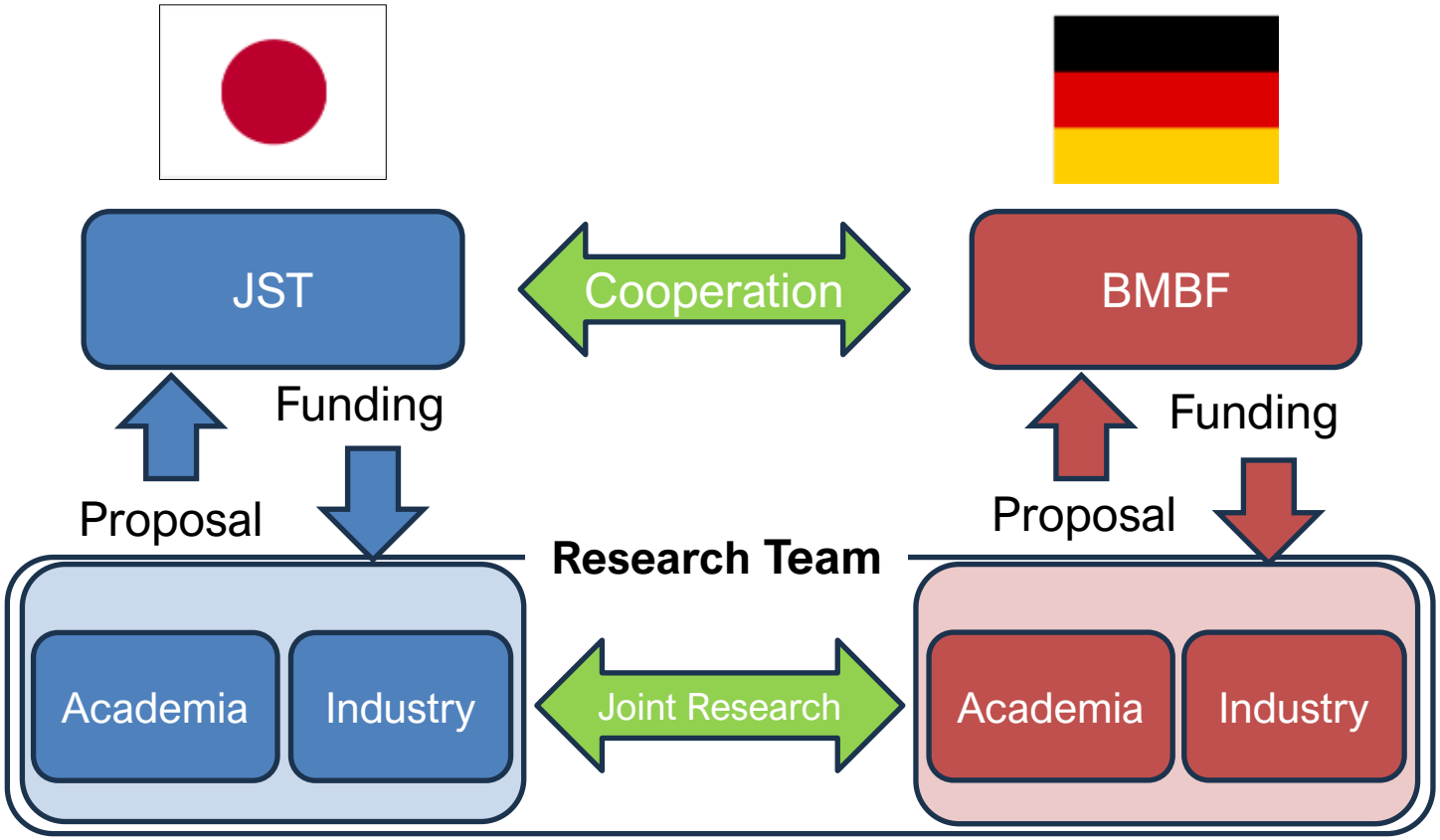


ANR – JST (2023 -)

- Edge AI

JST - BMBF “2+2” Collaborative Research Program

Program Scheme



JST- BMBF “2+2” Collaborative Research Program

Joint Calls Overview

- Optics Photonics I (FY2018 -)
  - 35 proposals, 3 selected
- Optics Photonics II (FY2020 -)
  - 24 proposals, 3 selected
- Hydrogen Technologies (FY2022 -)
  - 6 proposals, 3 selected
- General funding design
  - Research phase (upon completion): TRL3 – 7
  - Fund type: Grant
  - Fund amount per project: Germany: 600,000 EUR / Japan: 54,000,000 JPY
  - Research period: 36 months

JST- BMBF “2+2” Collaborative Research Program

Evaluation Criteria (Excerpt from the Photonics II Call Text)

- Fulfilment of the formal prerequisites for funding
- Compliance with the funding aims and purpose of the announcement and the thematic requirements
- Scientific and technological criteria
  - Quality and originality of the project
  - Relevance to BMBF programmes on the topic (only for German side)
  - Scientific and technological expertise of the applicant and the German and Japanese partners involved
  - Scientific benefits and prospects for the exploitation of the expected results
- Criteria concerning international cooperation
  - Experience of the applicant in international cooperation
  - Establishment of new or consolidation of already existing bilateral/international partnerships
  - Quality of the cooperation and **added value for partner institutions**
- Plausibility and feasibility of the project (financing; milestones; time frame)

JST- BMBF “2+2” Selected Projects

Optics and Photonics [First Stage]

Period : FY2018 - FY2021

Title	Research Leader in Japan Research Leader in Germany
Efficient Silicon Photonic Devices Using Advanced Electro-Optic Polymers	Shiyoshi YOKOYAMA, Professor, Kyushu University [Academia] Kyushu University [Industry] Nissan Chemical Industries, Ltd.
	Christian KOOS, Professor, Karlsruhe Institute of Technology (KIT) [Academia] Karlsruhe Institute of Technology [Industry] Vanguard Automation GmbH
Real-Time Fusion of Projection and Sensing by High-Speed Multispectral Units for Dynamic Interaction	Yoshihiro WATANABE, Associate Professor, Tokyo Institute of Technology [Academia] Tokyo Institute of Technology [Industry] Tokyo Electron Device LTD.
	Petra ASWENDT, CEO, ViALUX GmbH [Academia] Fraunhofer Institute [Industry] ViALUX GmbH
Development of Hyper-Resolution X-Ray Phase Imaging	Atsushi MOMOSE, Professor, Tohoku University [Academia] Tohoku University [Industry] Hamamatsu Photonics K.K.
	Jurgen MOHR, Head of X-ray optics group, Karlsruhe Institute of Technology [Academia]Karlsruhe Institute of Technology [Industry] microworks GmbH

JST- BMBF “2+2” Selected Projects

Optics and Photonics [Second Stage]

Period : FY2020 - FY2023

Title	Research Leader in Japan Research Leader in Germany
Miniaturized full-organic spectroscopic NIR-OLED-sensor-systems	Junji KIDO, Professor, Yamagata University [Academia] Yamagata University [Industry] ITO Electronic Co., Ltd.
	Karl LEO, Professor, Technische Universität Dresden [Academia] Technische Universität Dresden [Industry] Senorics GmbH
Novel plasmonic materials and nanostructures for ultrasensitive and reproducible SERS/OW/LSPR biosensing for biomedical applications	Eiichi TAMIYA, Professor, AIST-Osaka University Advanced Photonics and Biosensing Open Innovation Laboratory [Academia] AIST-Osaka University [Industry] Furuno Electric Co., Ltd.
	Wolfgang FRITZSCHE, Professor, Leibniz Institute of Photonic Technology (IPHT) Jena [Academia] Leibniz Institute of Photonic Technology (IPHT) Jena [Industry] Temicon GmbH
Mid-IR and near-IR laser source and optics for high-brightness EUV radiation	Kaoru YAMANOUCHI, Professor, The University of Tokyo [Academia] The University of Tokyo [Industry] TOKAI OPTICAL CO., LTD.
	Jens LIMPERT, Professor, University Jena [Academia]University Jena [Industry] Active Fiber Systems GmbH (AFS)

JST- BMBF “2+2” Selected Projects

Hydrogen Technologies

Period : FY2022 - FY2024

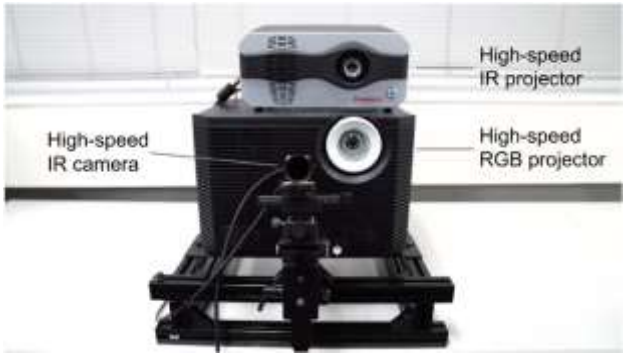
Title	Research Leader in Japan Research Leader in Germany
Durable and Efficient Compound Electrodes for Hydrogen Generation in PEM Electrolysis	[Academia] MIYAZAKI Kohei, Associate Professor, Graduate School of Engineering, Kyoto University [Industry] HORIKAWA Matsuhide, Executive Officer and General Manager, Technical Development Center, Toho Titanium Co., Ltd.,
	[Academia] SCHRODER Daniel, Professor, Institute of Energy and Process Systems Engineering, Technische Universität Braunschweig [Industry] HICKMANN Thorsten, CEO, Eisenhuth GmbH & Co. KG
Sustainable and Hydrogen-Compatible Sealing Materials: Key Element for Ensuring Safety and Diversity of Hydrogen Supply Network	[Academia] SAWAE Yoshinori, Professor, Faculty of Engineering, Kyushu University [Industry] HONDA Shigenobu, Manager of technical planning section, NOK Corporation
	[Academia] GRADT Thomas, Head of Division "Tribology and Wear Protection", Federal Institute for Materials Research and Testing (BAM) [Industry] RÖCKER Thorsten, Scientific Expert, Freudenberg Technology Innovation SE & Co. KG
Green ammonia synthesis and utilization for marine transport by SOC Technology	[Academia] HORITA Teruhisa, Director, Research Institute for Energy Conservation, National Institute of Advanced Industrial Science and Technology (AIST) [Industry] SUMI Hiroshi, Manager, MORIMURA SOFC TECHNOLOGY CO., LTD.
	[Academia] MIHAILS Kusnezoff, Head of Department of Materials and Components, Institute for Ceramic Technologies and Systems (IKTS), Fraunhofer Institute [Industry] MICHAEL Haid, CEO, EDL Anlagenbau Gesellschaft mbH

Major Research Results (1)

Optics Photonics Ⅰ: “Real-Time Fusion of Projection and Sensing by High-Speed Multispectral Units for Dynamic Interaction”

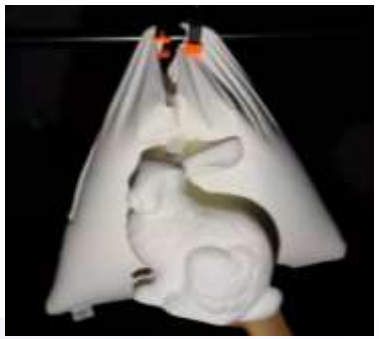
- Japan side：Yoshihiro WATANABE, Associate Professor, Tokyo Institute of Technology
- Germany side：Petra ASWENDT, CEO, ViALUX GmbH

The High-Speed Projector for New Projection Mapping was developed that can project RGB and invisible infrared images simultaneously and independently at a high speed of almost 1,000 fps onto sophisticated moving objects.



Developed high-speed RGB+IR projector

http://www.vision.ict.e.titech.ac.jp/projects/DepthAwareDPM/index-j.html



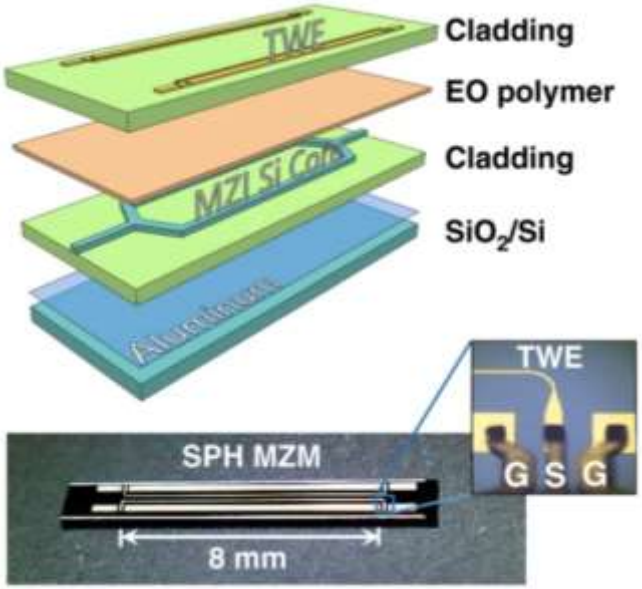
Dynamically projected

Major Research Results (2)

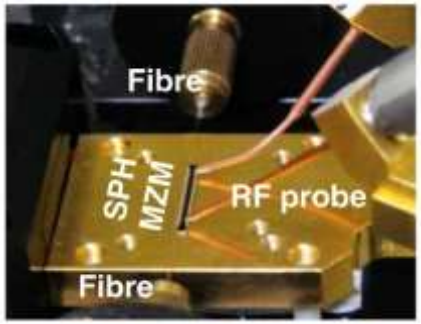
Optics Photonics I : "**Efficient Silicon Photonic Devices Using Advanced Electro-Optic Polymers**"

- Japan side : Shiyoshi YOKOYAMA, Professor, Kyushu University
- Germany side : Christian KOOS, Professor, Karlsruhe Institute of Technology

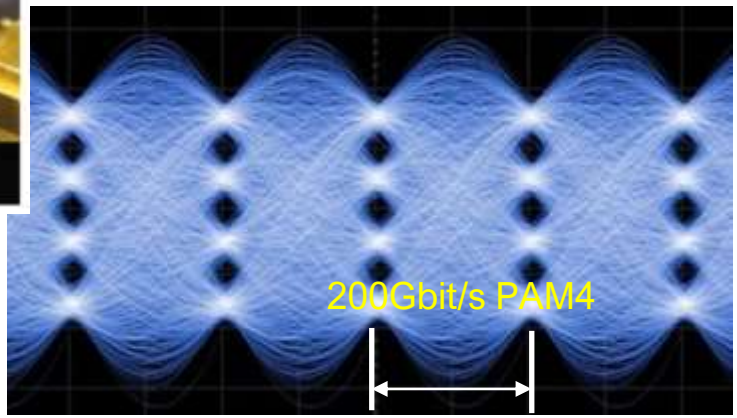
The silicon-polymer hybrid modulators can transmit 200 gigabits of data per second at up to 110℃ and could enable optical data interconnections that are both extremely fast and reliable at high temperatures, reducing the need for cooling and expanding applications in harsh environments like rooftops and cars.



Developed silicon-polymer hybrid modulator



The signals can take one of four different levels that correspond to two bits each, resulting in three holes in the overlapping signals.



This result was published in Nature Communications
https://www.nature.com/articles/s41467-020-18005-7

Thank you !

Japan Science and Technology Agency