

# Positron source investigation through Prefectural Industrial Technology Center-Academia-Private Companies collaboration

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Shin-ichi Takizawa



On behalf of the following collaboration team members:

- <sup>(A)</sup>Hiroshima University, <sup>(B)</sup>KEK, <sup>(C)</sup>Iwate/Tohoku University
  - <sup>(A)</sup> Masao Kuriki, <sup>(B)</sup> Tsunehiko Omori, <sup>(A)</sup> Tohru Takahashi, <sup>(C)</sup>Masakazu Yoshioka
- <sup>(D)</sup>Iwate Prefectural Industrial Technology Center, <sup>(E)</sup>Iwate Industry Promotion Center
  - <sup>(D)</sup> Takashi Imura, <sup>(E)</sup> Ken-ichi Kon, <sup>(D)</sup> Tetsuya Sonoda, <sup>(D)</sup> Sekai Terabe,
- <sup>(F)</sup>Kondo Equipment Co., Ltd., <sup>(G)</sup>TOHOKU SEIMITSU CO., LTD., <sup>(H)</sup>Metal Technology Co., Ltd.
  - <sup>(G)</sup> Takeshi Hamasaki, <sup>(F)</sup> Masahiko Kondo, <sup>(H)</sup> Masao Tsuchiya, <sup>(F)</sup> Yoshiaki Yoshida

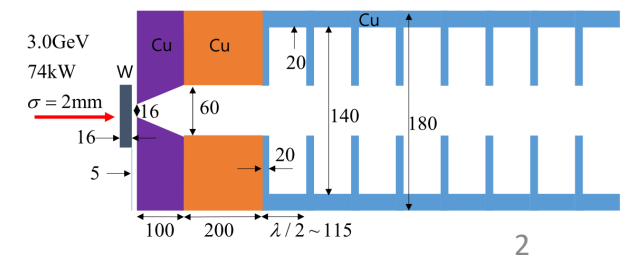
# Technical issues required for the development of positron sources (excluding positron-producing targets)

- Heat load due to electromagnetic shower irradiation from the positron-producing target
- Flux concentrator & Collimator
  - ✓ High-efficiency water cooling system
  - ✓ High pulse current to generate a high magnetic field
- Accelerating structure
  - ✓ Accelerating structure placed in a strong solenoid magnetic field
  - ✓ Effect of electromagnetic shower irradiation on heat load and secondary electron emission
- Vacuum system
  - ✓ Vacuum connection/disconnection between subsystems considering maintenance scenarios in high radiation environments
- Others

Parameters and geometry in Geant4

1320 bunches

Ee	$\sigma_e$	e-/bunch	Beam Power	Total thickness
GeV	mm	nC	kW	mm
3.0	2	2.4	48	16



## Contributions from the Tohoku/Iwate region to this team

- Development of high efficiency water cooling system and dynamic thermal analysis for the system (ANSYS)
- Precision metalworking technology
  - 3D-CAD based structural and thermal design
  - Precision metal cutting
  - Surface treatment, surface grinding
  - Design and manufacturing of high-efficiency cooling water systems
    - ✓ Water cooling for high heat load equipment
    - ✓ Precise temperature control of accelerating structure cooling water
- Metal-to-metal precision diffusion bonding technology



One example for reference

- Muon production target for J-PARC muon experiments (by MTC)
- Central part (black disc) is the Muon production graphite target
- Periphery (copper) is the heat sink with SUS pipe encapsulated in a spiral way by using a HIP (Hot Isostatic Pressing) technology
- The same technology can be applied to install cooling channels in the positron system

**Industry**



Metal Technology Co., Ltd.



Tohoku Seimitsu Co., Ltd.



Kondo Equipment Co., Ltd.

**Technical support & advice**

**Government**



Iwate Industrial Research Institute



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**Academia**



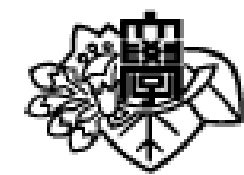
Research Institute



Hiroshima Univ.

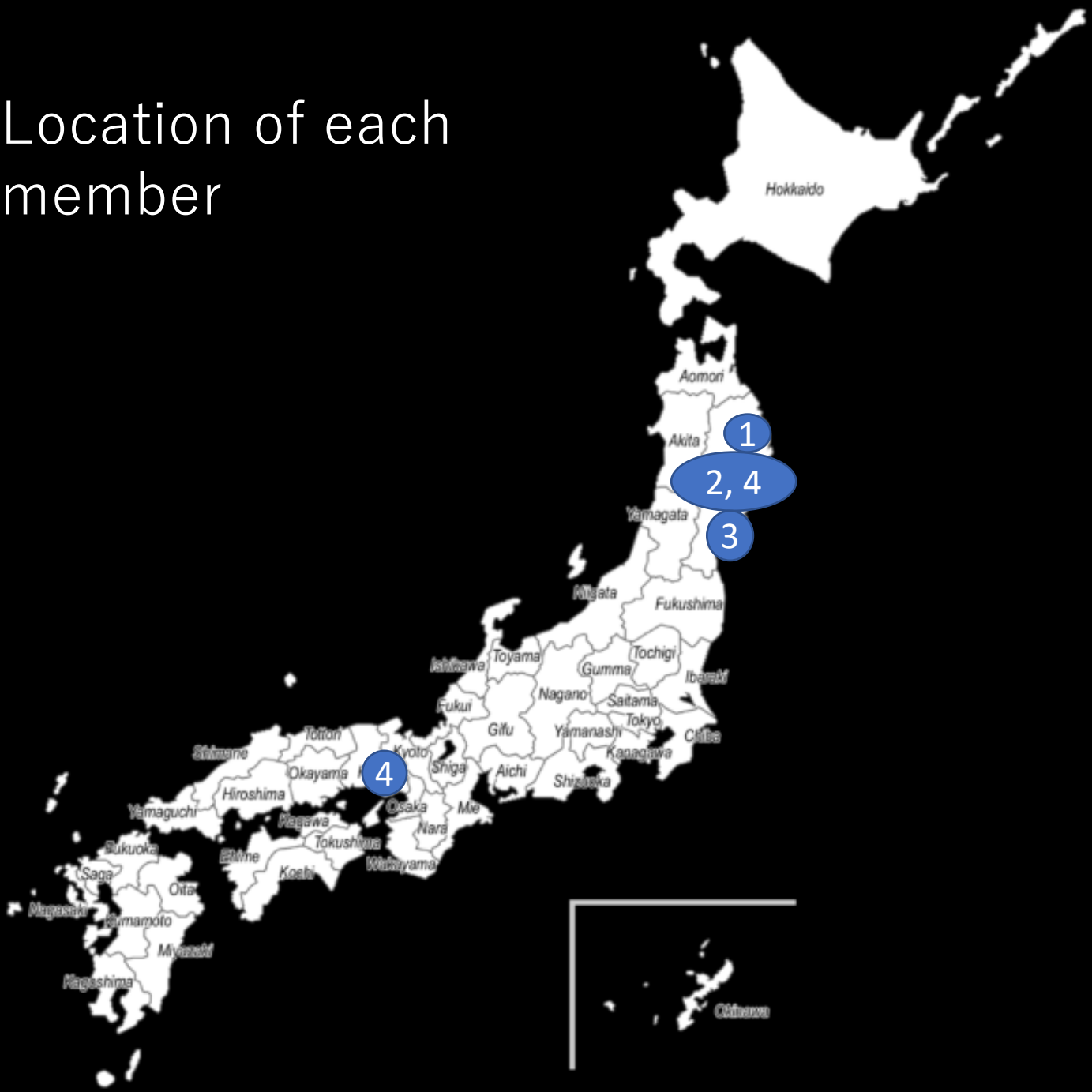


Tohoku Univ.



Iwate Univ.

# Location of each member



1

岩手大学  
IWATE UNIVERSITY

地方独立行政法人  
岩手県工業技術センター  
IWATE INDUSTRIAL RESEARCH INSTITUTE

公 益 財団法人  
いわて産業振興センター  
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2

konsetsu

TSK 東北精密株式会社  
TOHOKU SEIMITSU CO. LTD.

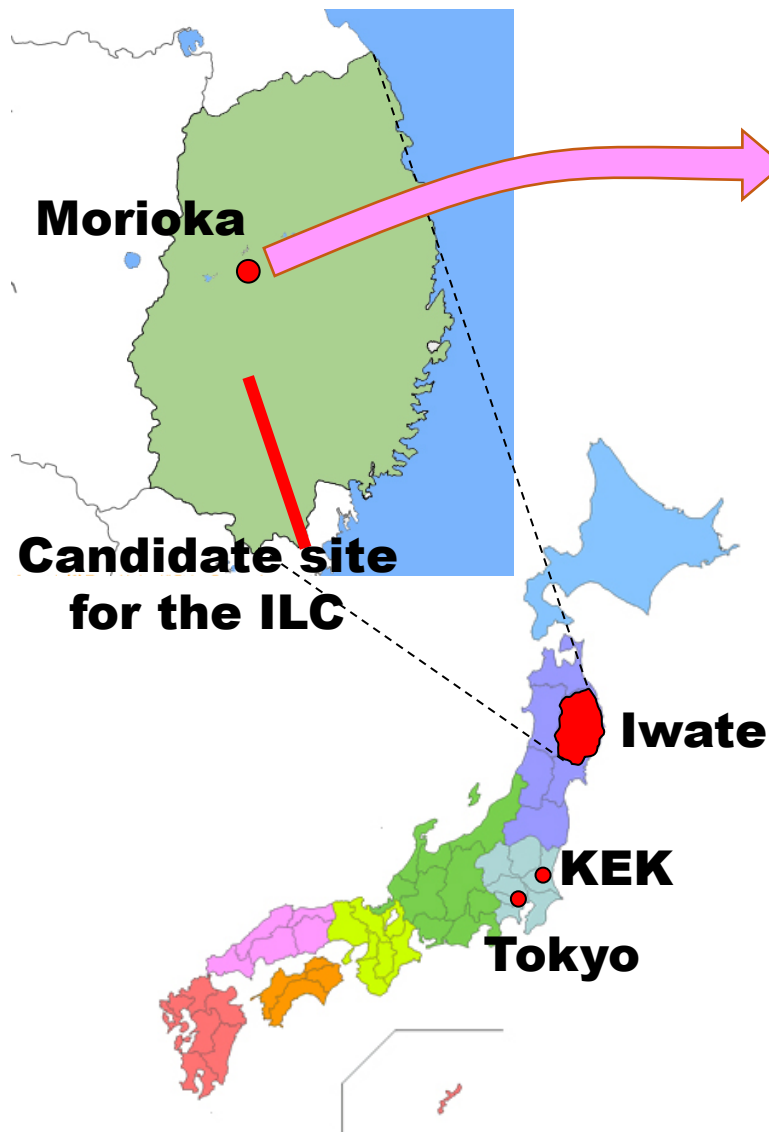
3



4

MTC  
Metal Technology Co. Ltd.

# Overview of the Iwate Industrial Research Institute



**Iwate Industrial Research Institute**  
( = Public Research Organization )



President	T. Kimura
Establishment	1873
Employees	63 (in research positions: 55)
Lot area	67,744 m <sup>2</sup>
Building area	10,177 m <sup>2</sup>

# Our mission



Iwate Industrial Research Institute

“The joy of creating, and contributing to the region”

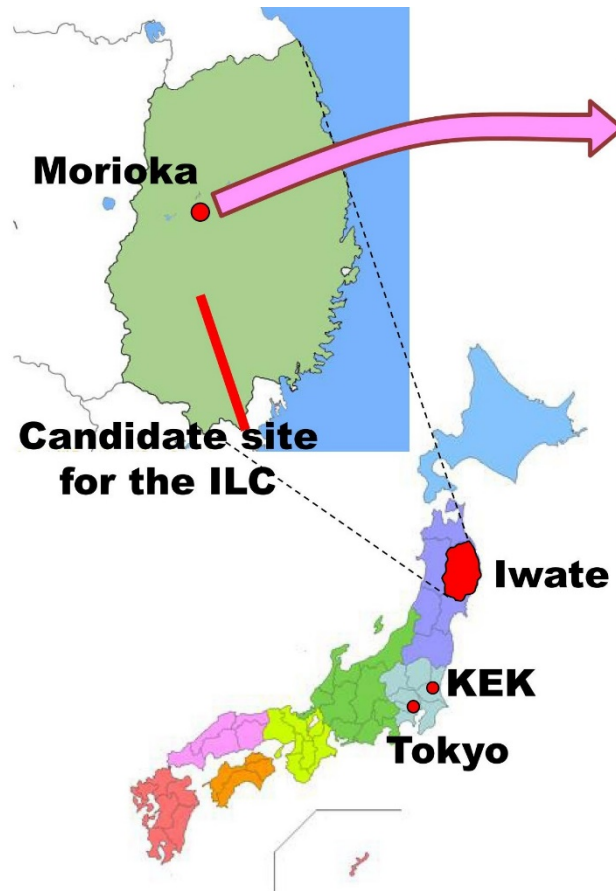
## Mission

Universities	Academic research
National Institutes	Solutions for national-level issues Support for major enterprises
Public Research Organizations	Solutions for regional-level issues Support for small-to-medium companies Technical consultations Experiments on contract Equipment lending

# Overview of the Iwate Industry Promotion Center



(C) Iwate Industry Promotion Center, 2021



 **Iwate Industry Promotion Center**  
(= Public industry support organization)



President : T.Otomo  
Employees : 88  
(in research positions : 2)  
Establishment 2013

# Our mission

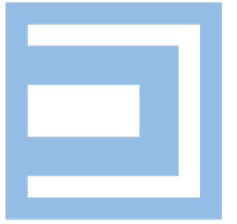
## Iwate Industry Promotion Center

Comprehensive support for new industry creation and industry promotion  
(新しい産業の創造と産業振興のための包括的なサポート)

### Mission

#### Local SME problem-solving support (地元中小企業の問題解決支援)

- Support of business opportunities
  - Securing human resources
  - Financial support
  - Transaction support
  - R & D support
- 販路拡大 → 総合的な経営相談  
人材確保 → 人材育成支援  
金融支援 → 設備貸与、利子補給  
取引支援 → 展示会等の開催  
研究開発支援  
→ プロジェクトの提案とマネジメント



konsetsu

# Company Profile

## CEO

Masahiko Kondo

## Location

6-13.Distribution Center,kitakami-City.Iwate Prefecture

## Number of employees

100 people (as of March 2021)

## Sales office

- Kitakami General Office
- Headquarters (Nishiwaga Town, Iwate Prefecture)
- Tokyo Sales Office
- Morioka Sales Office
- Miyako Sales Office
- Sendai Sales Office

## processing center

- Kitakami Processing Center
- Hanamaki Special Processing Center



Kitakami General Office



Hanamaki Special Processing Center

