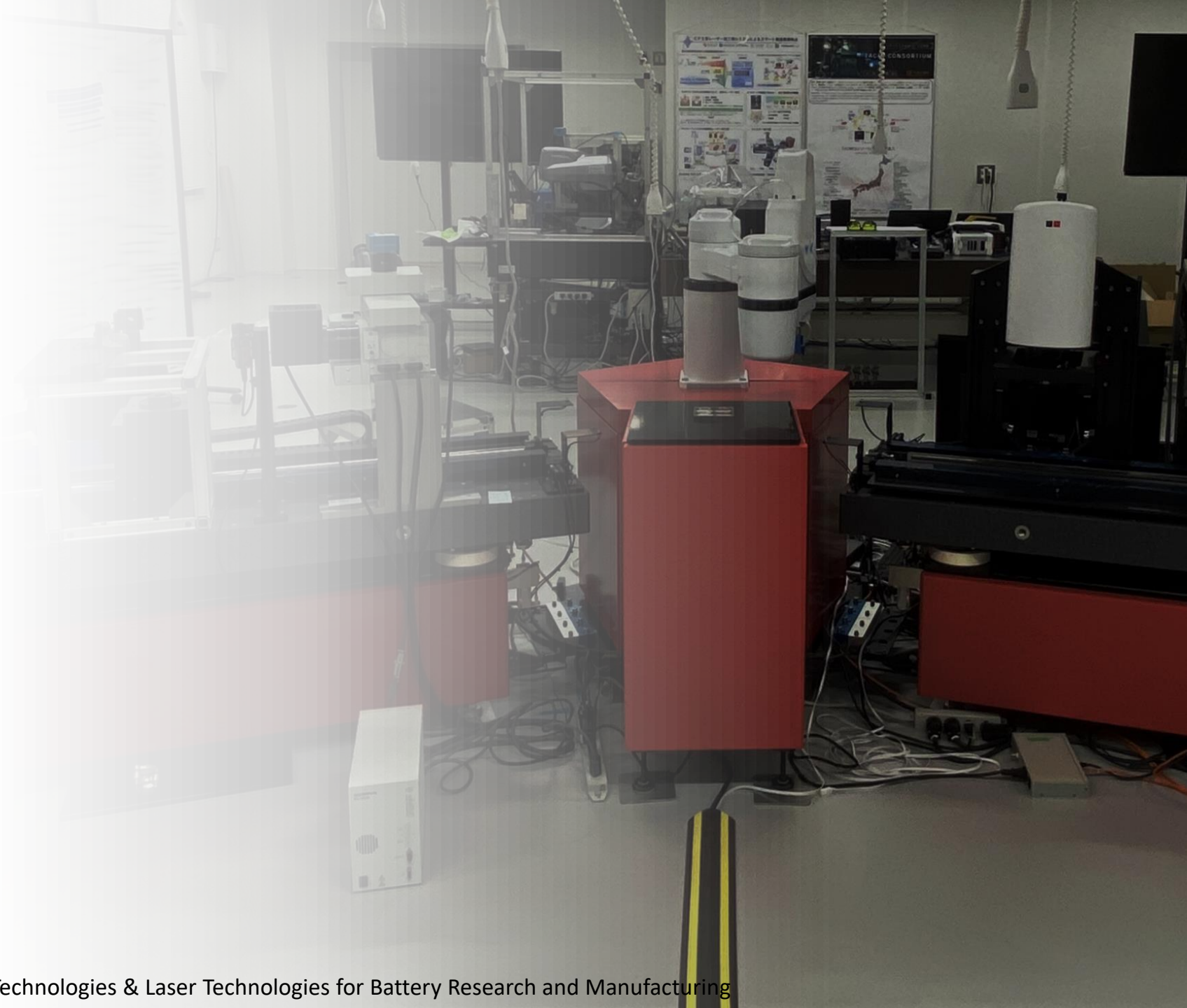




# Cyber-Physical System for Laser Manufacturing

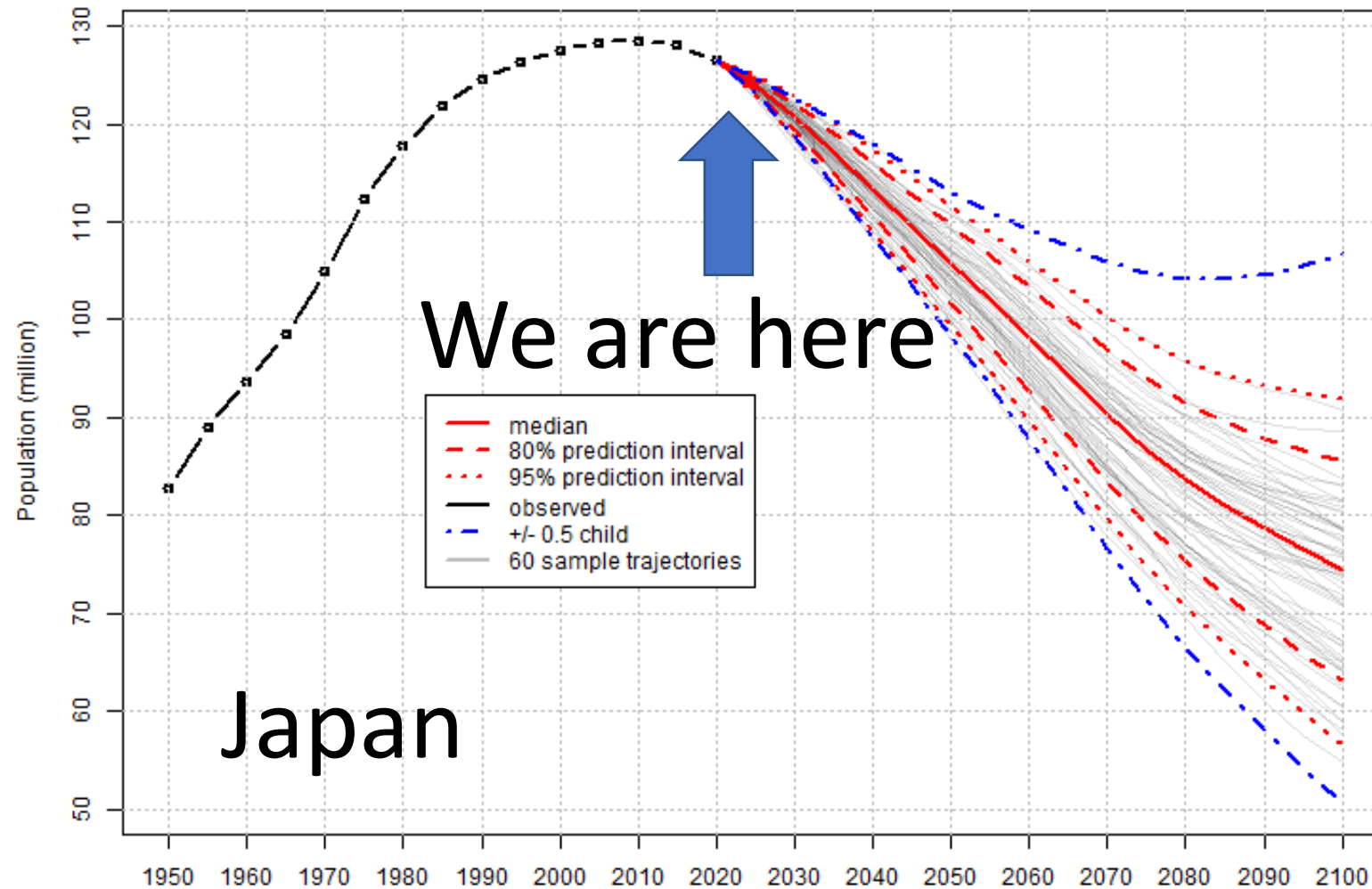
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The University of Tokyo,  
Yohei Kobayashi



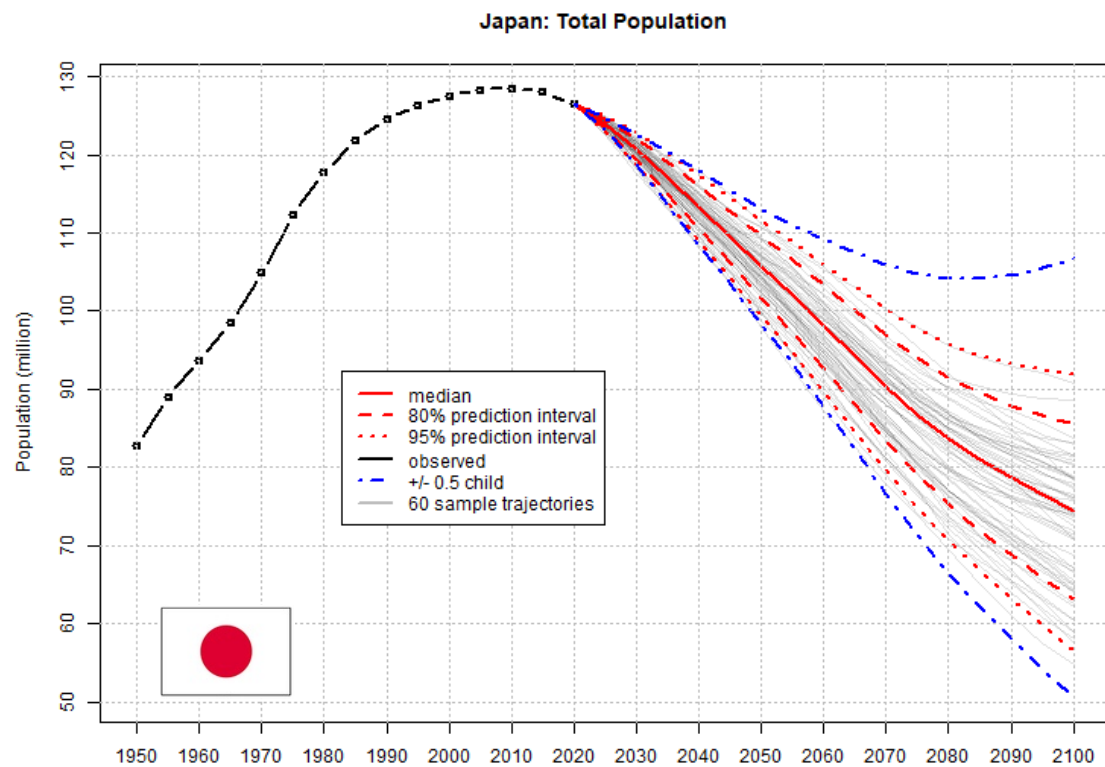
# Population change (forecast) in Japan

<https://population.un.org/wpp/Graphs/Probabilistic/POP/TOT/392>



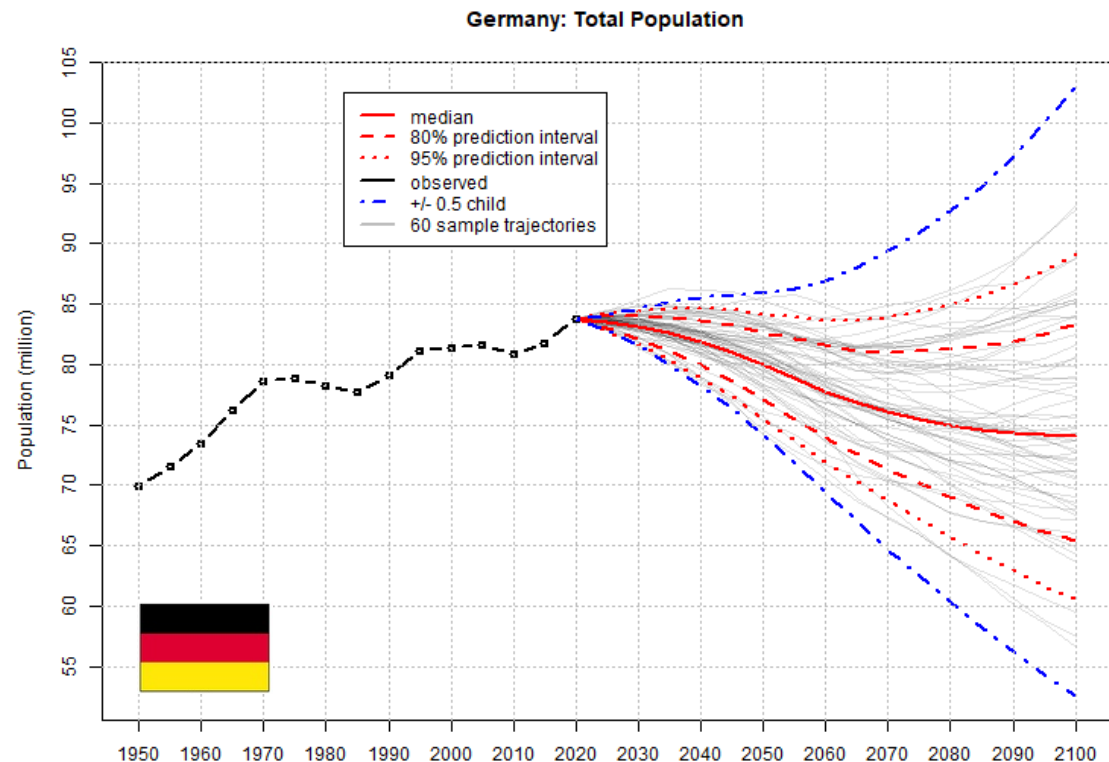
# Germany may have the same issue

## Japan



© 2019 United Nations, DESA, Population Division. Licensed under Creative Commons license CC BY 3.0 IGO.  
United Nations, DESA, Population Division. *World Population Prospects 2019*. <http://population.un.org/wpp/>

## Germany



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United Nations, DESA, Population Division. *World Population Prospects 2019*. <http://population.un.org/wpp/>

# Issues & Solutions

✓ Reduction in labor power

→ Productivity improvement

Eco system with help of IoT & CPS

→ **Laser manufacturing**

✓ Super-aging Society

→ realization of inclusive society

Mass-customization

→ **Laser manufacturing**

# ***How to increase the productivity ?***

Less lead time with less labor



Find Recipe (parameters) effectively



Simulator



Understand what is going on in a material

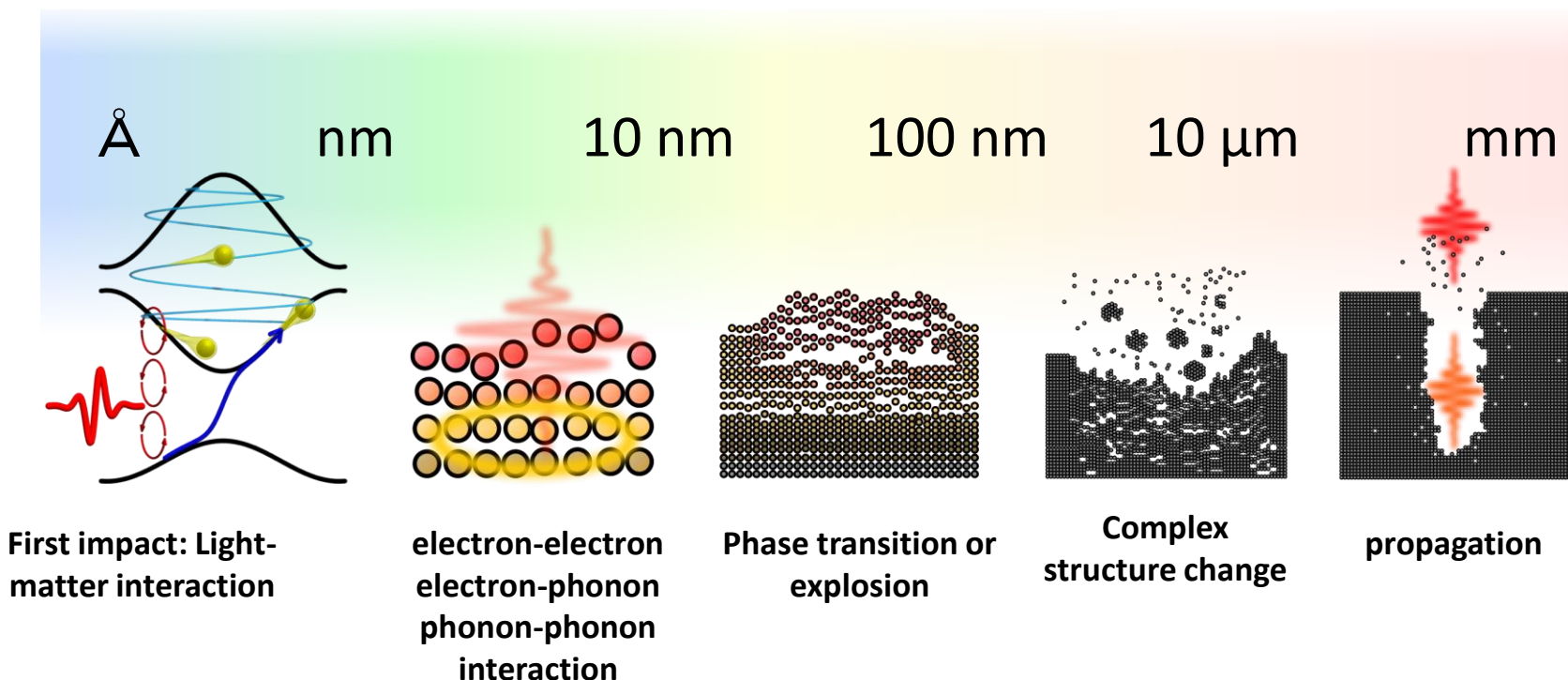


# Theoretical solution

# Why difficult?

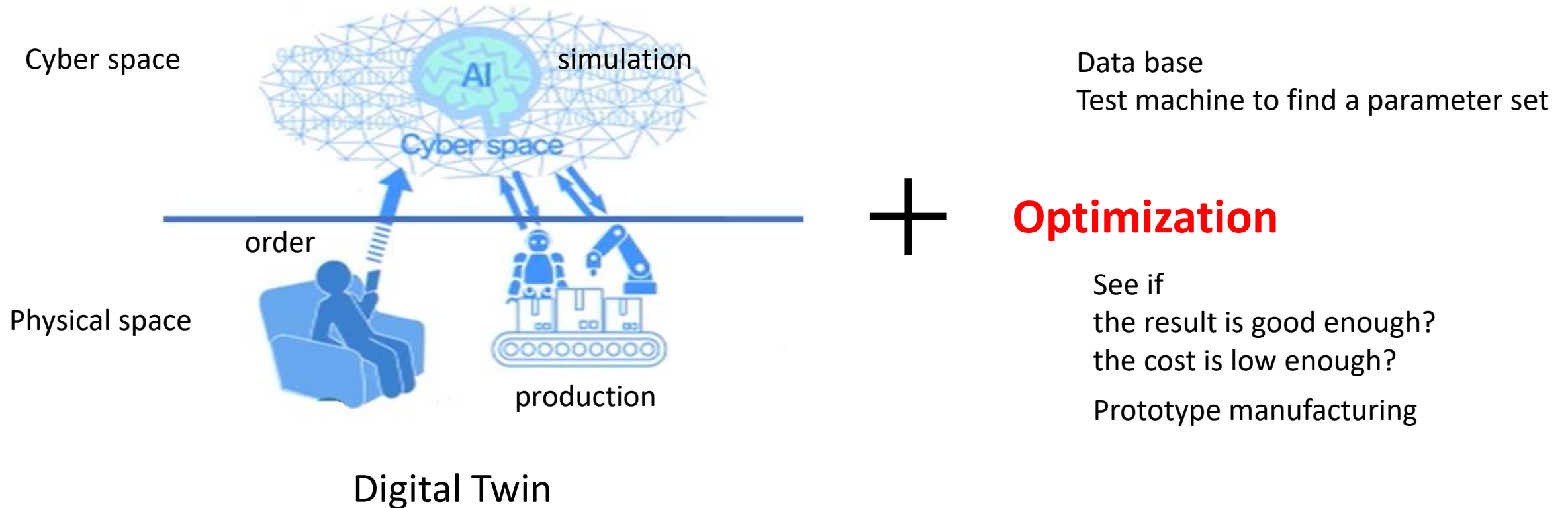
Laser processing includes many different & difficult physics

Nonlinear, non-equilibrium, open system, multi disciplinary



AI-based simulator needs to be established before theory.

# Cyber-Physical System

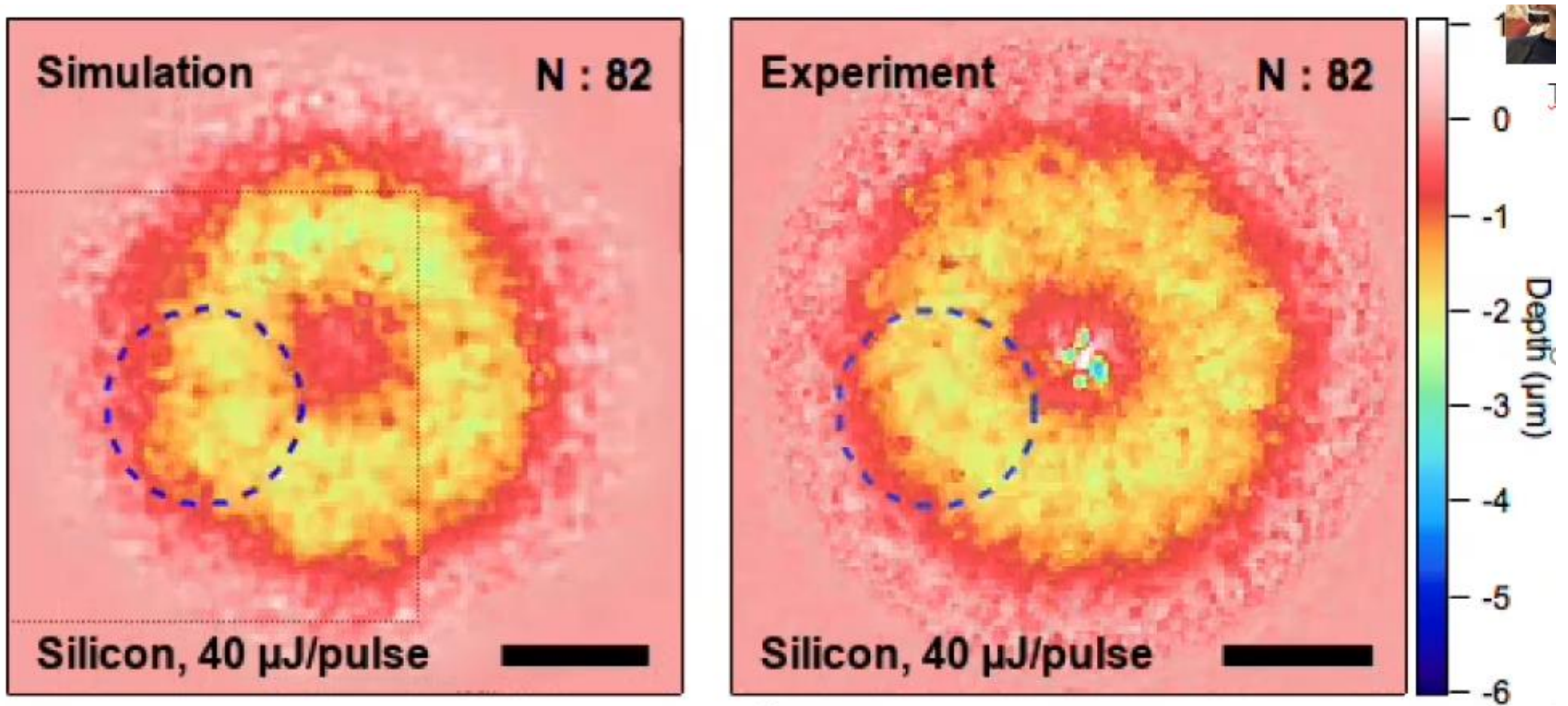


CPS is a highly integrated system of Cyber and Physical system.

# AI Simulator

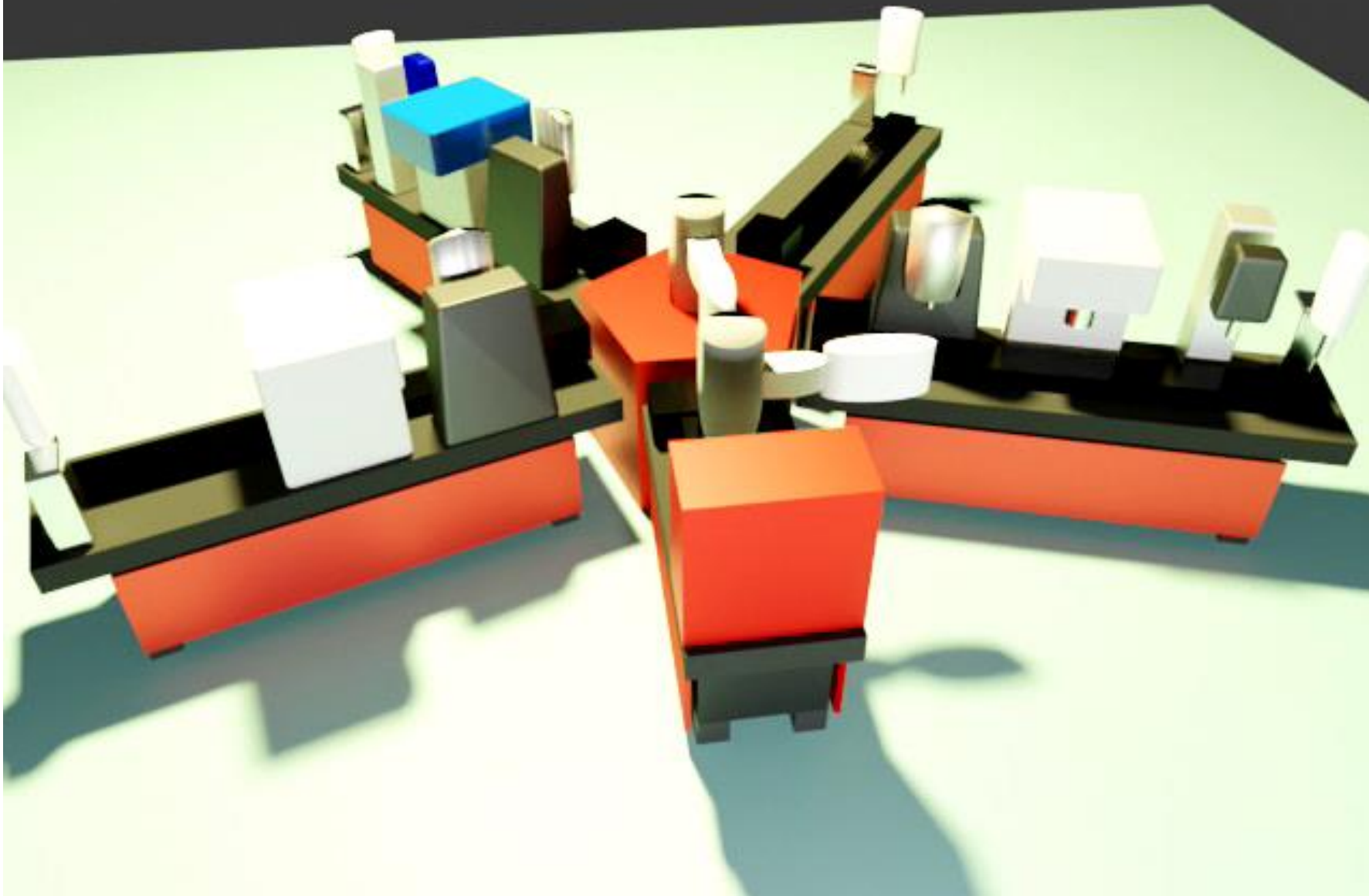


# Silicon drilling - Top view -



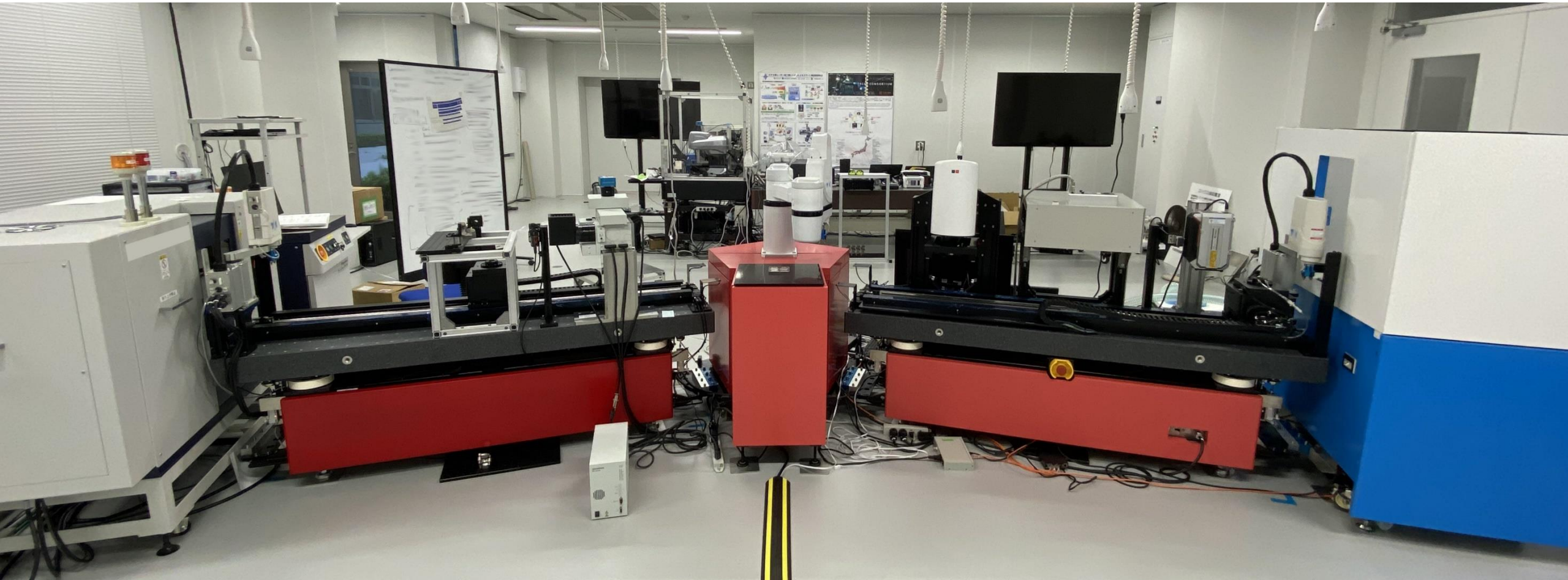
# Cyber-physical system

# Meister DATA Generator





# MDG: 24 Hours, 7days Operation



Yohei Kobayashi et.al, IEEE JSTQE, vol. 27, pp. 1-8, (2021)

Collaborative knowledge consensus

## **TACMI Consortium**

Technological **A**pproaches toward  
**C**ool laser **M**anufacturing with  
**I**ntelligence

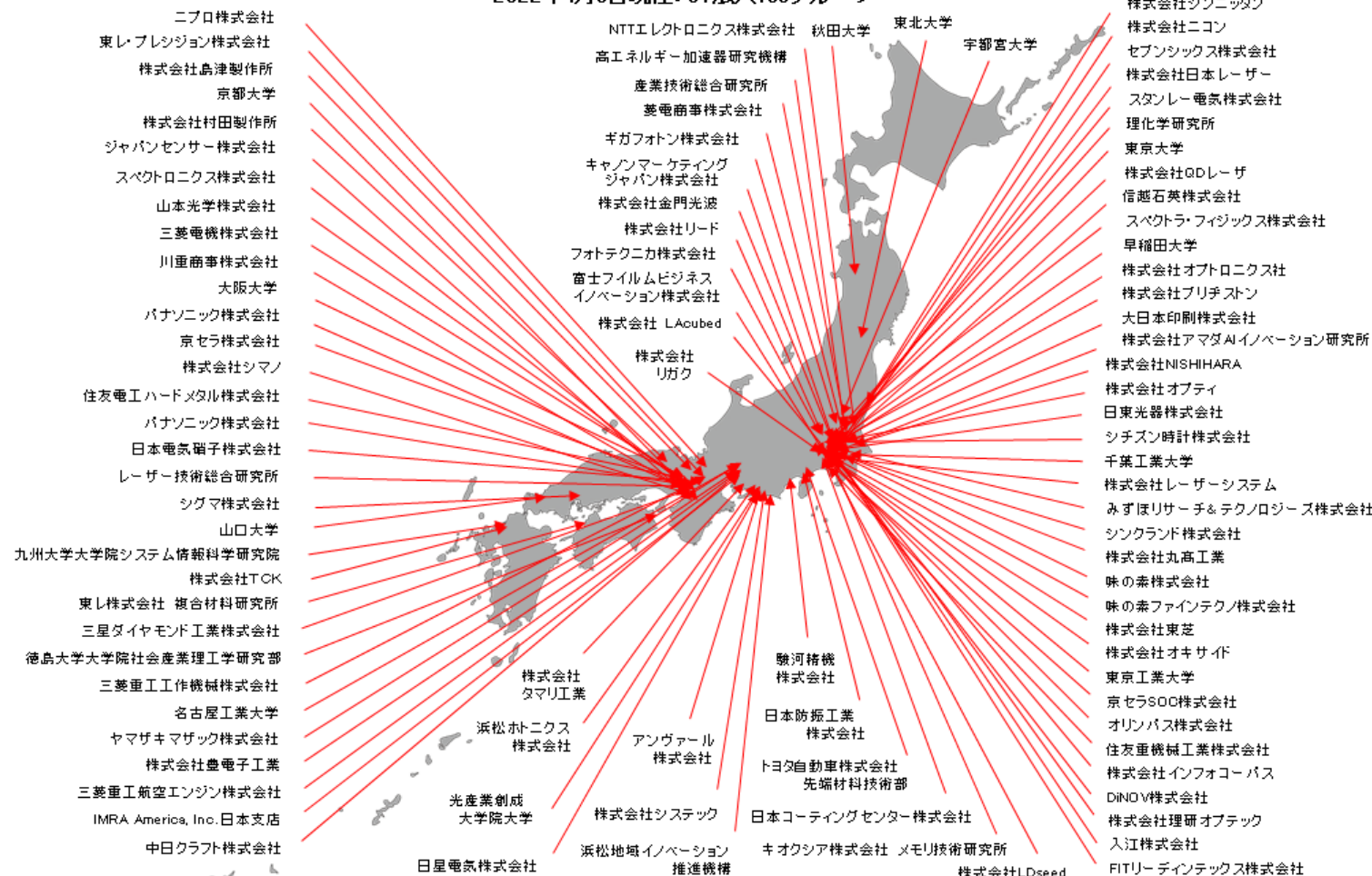




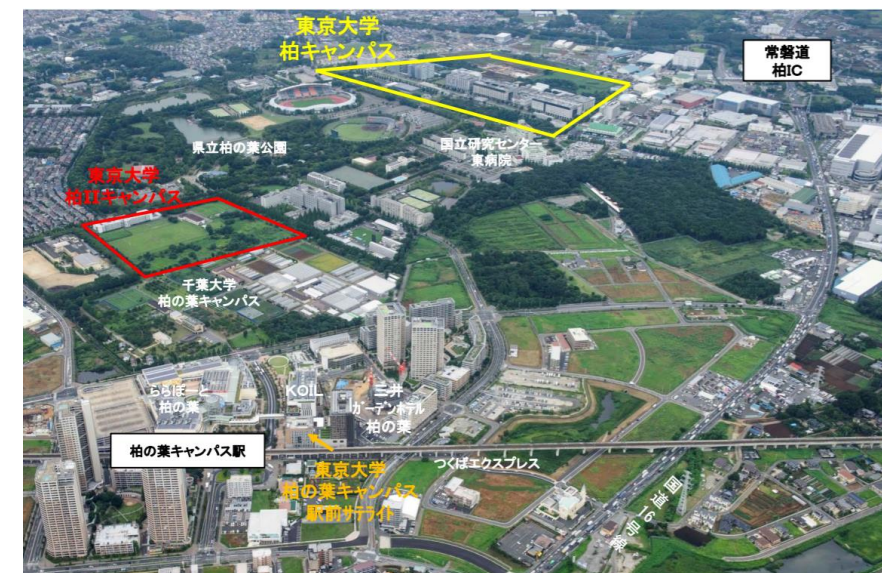
<http://www.utripl.u-tokyo.ac.jp/tacmi/>

## TACMIコンソーシアム参加法人

2022年4月8日現在: 97法人100グループ



Univ. of Tokyo





Thank you for your attention.

Contact info.

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