

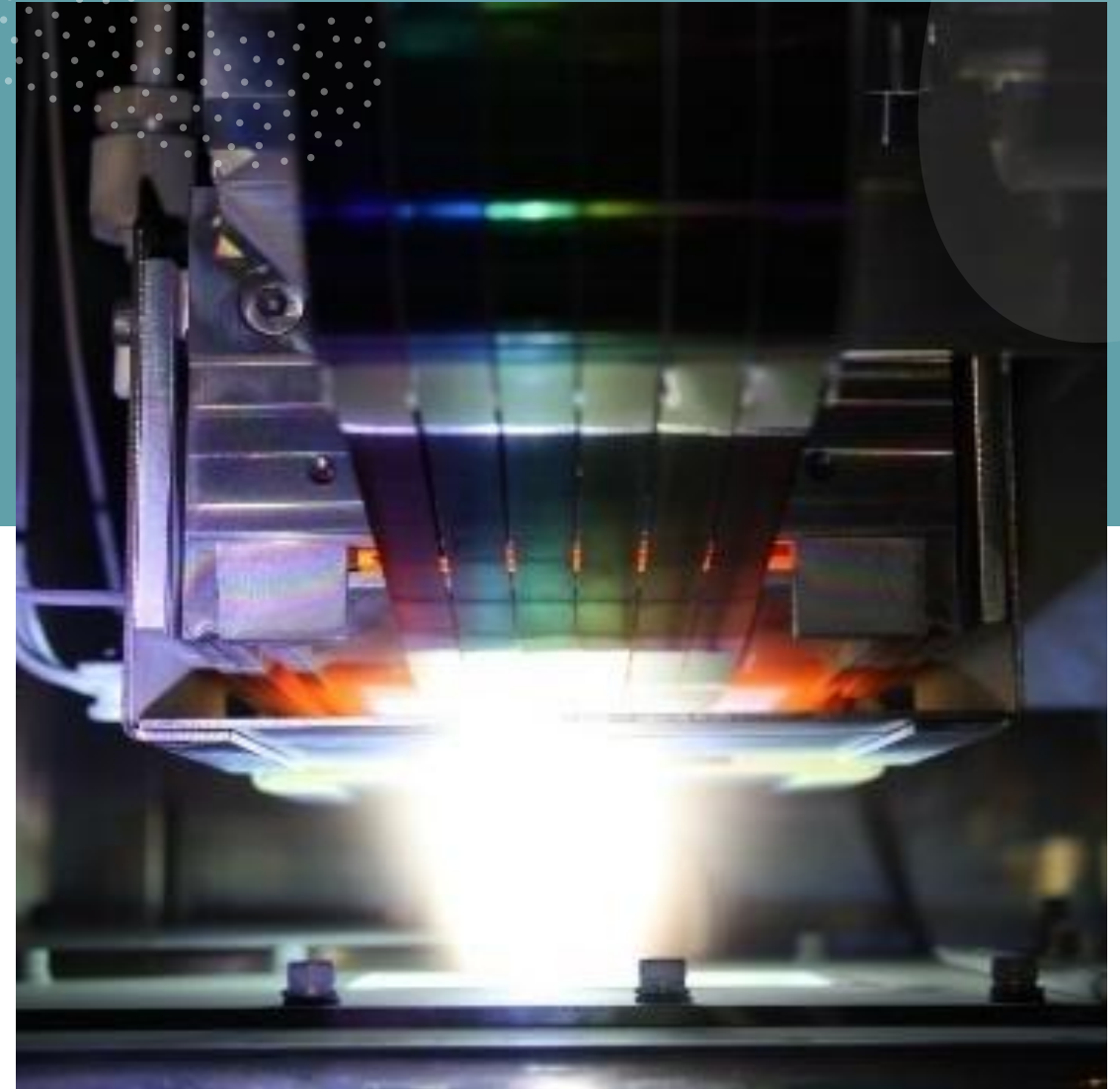
4CM1

New Horizons for PLD-based Technology of 2G HTS Tapes

Sergey Lee and Valery Petrykin

FARADAY FACTORY JAPAN LLC

Sagamihara, Kanagawa, Japan





FFJ background, mission, and milestones

Previous company name SuperOx Japan LLC (July 2011 - Dec 2022)

July 2022 Owned by Faraday 1867 Holding LLC, USA

Mission Serve the world market with high quality 2G HTS tape, in large volume, at an affordable price. **Make GAm-scale production of high quality HTS tape a reality**

Milestones

2023

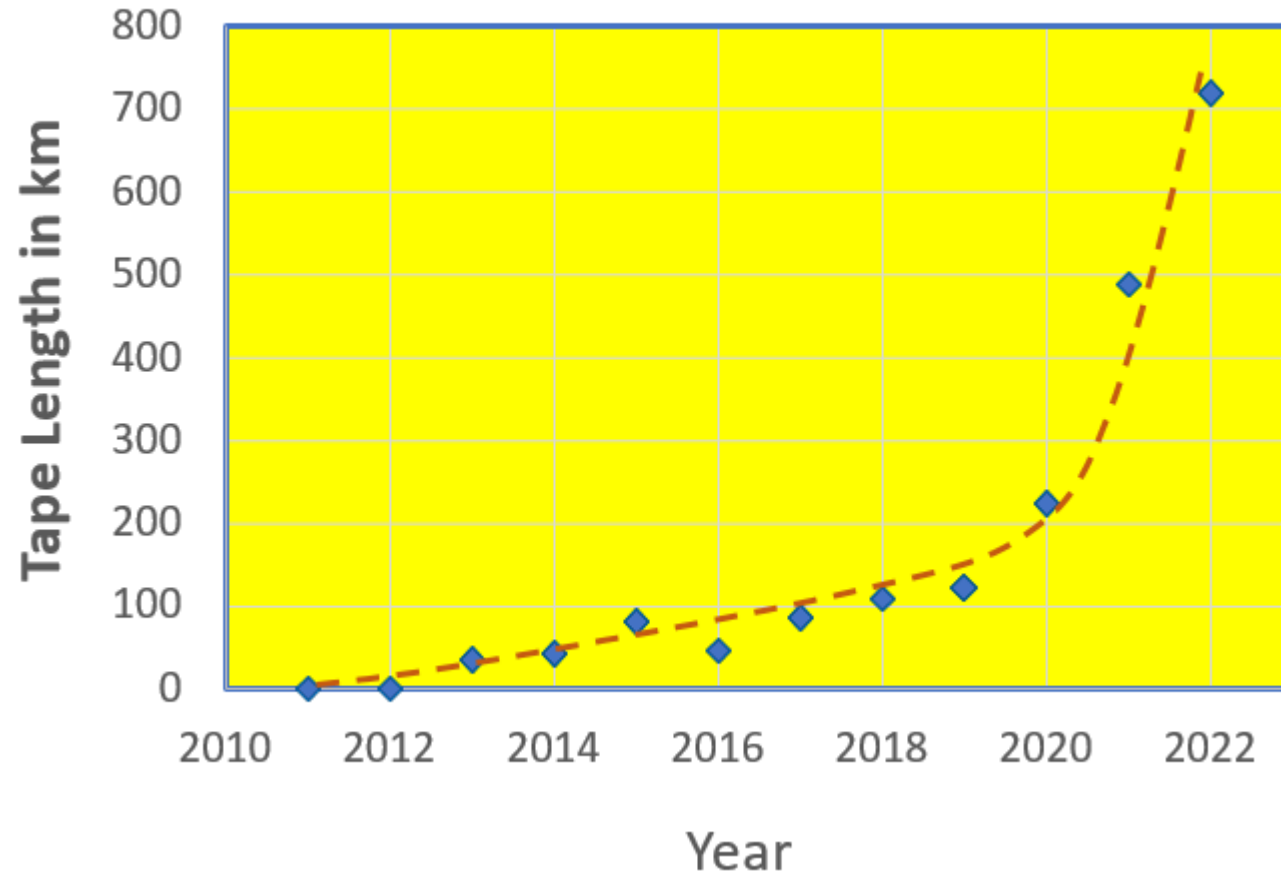
Establish world-largest 2G HTS tape production factory: full production cycle 0.4 GA-m/year

2024

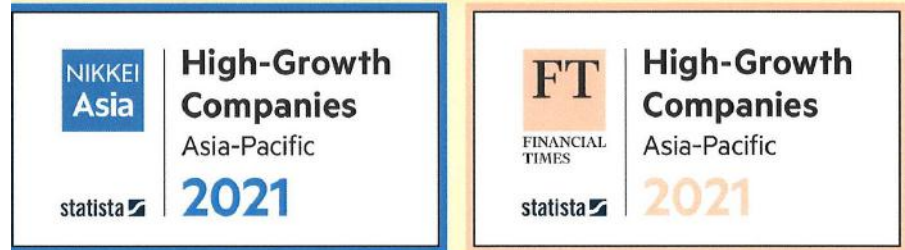
Demonstration of PLD- based production capacity up to 1 GA-m/year

Rapid growth of production in last 2 years

4mm HTS Wire Production by SOJ



"High-Growth Companies Asia Pacific 2021"
The official logos by Nikkei Asia and The Financial Times














SuperOx Japan ranked 87th of TOP 500 Asia-Pacific High-Growth companies (2nd in the "Industrial Goods" category) according to Nikkei Asia – Financial Times - Statista

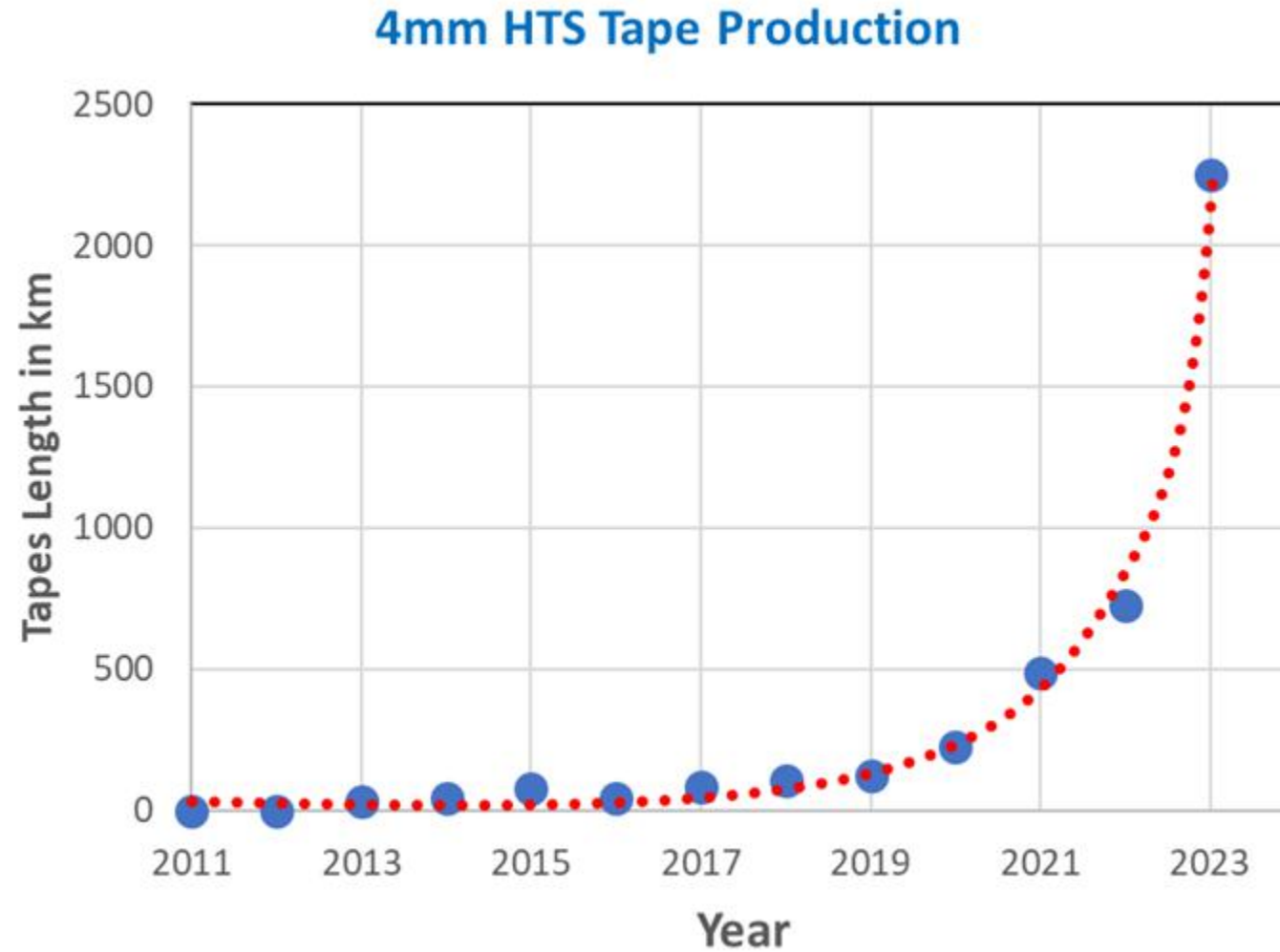


SuperOx Japan ranked in 2022 TOP 500 Asia-Pacific High-Growth companies Ranking

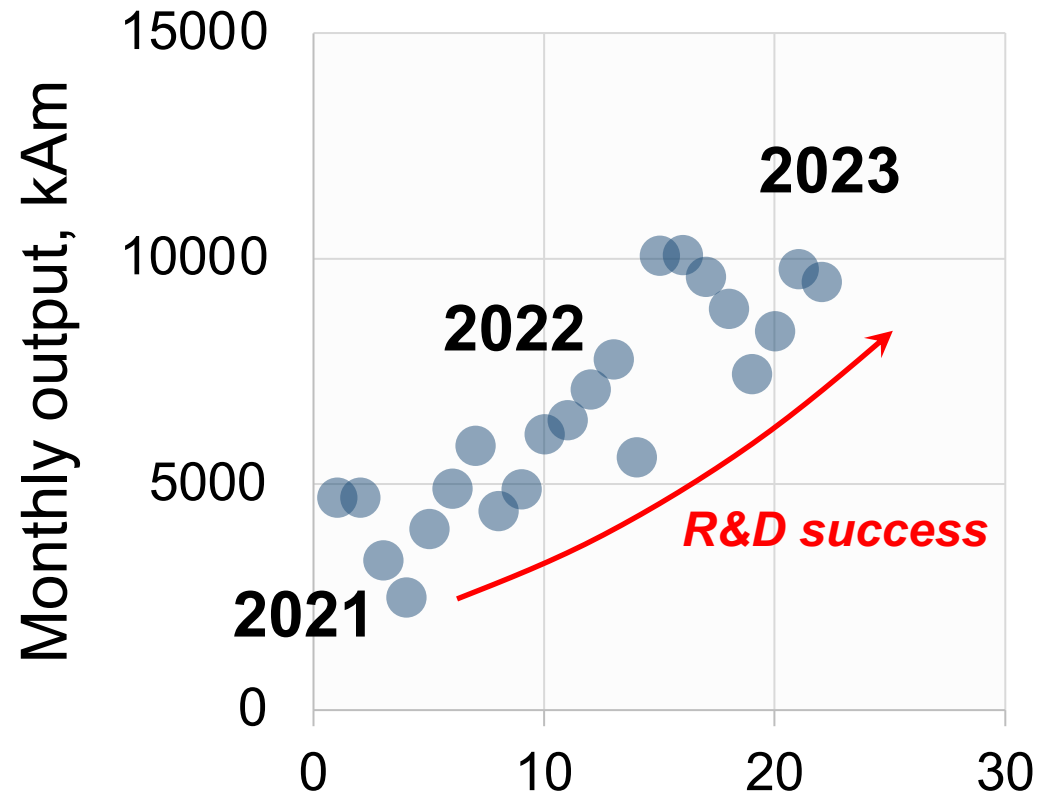
Different methods for HTS production

PLD	MOCVD	RCE	MOD	
 IBAD/PLD Japan/USA	  IBAD/MOCVD USA-Japan	 IBAD, RCE/PLD S.Korea	 RABiTS/ MOD USA 	
 IBAD/PLD China	 IBAD/PLD USA	 IBAD/ MOCVD USA	 ISD/RCE Germany	 Creating for the Future IBAD/MOD, Japan

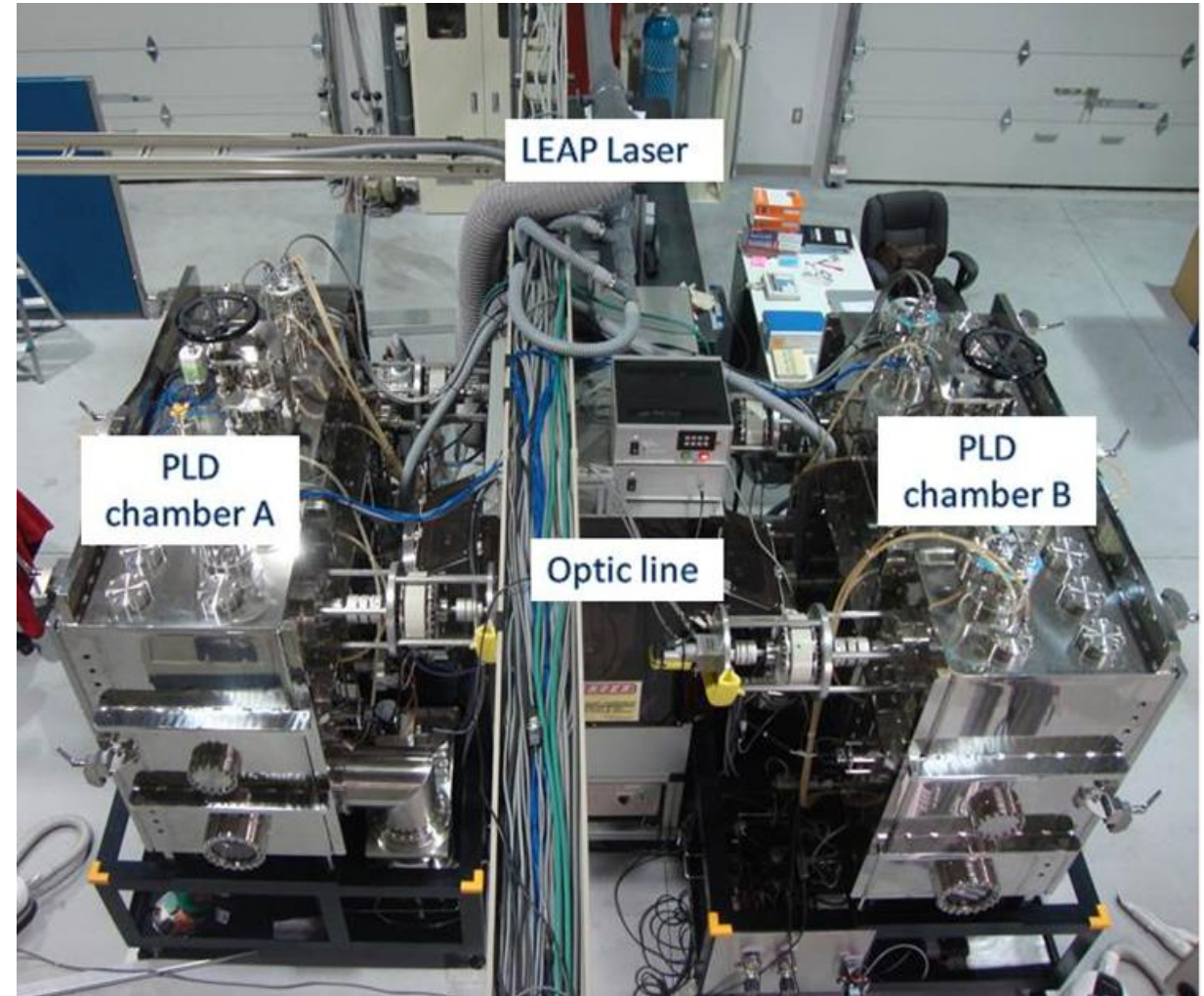
Production plans for 2023



Standard production unit (300W laser + 2 chambers)



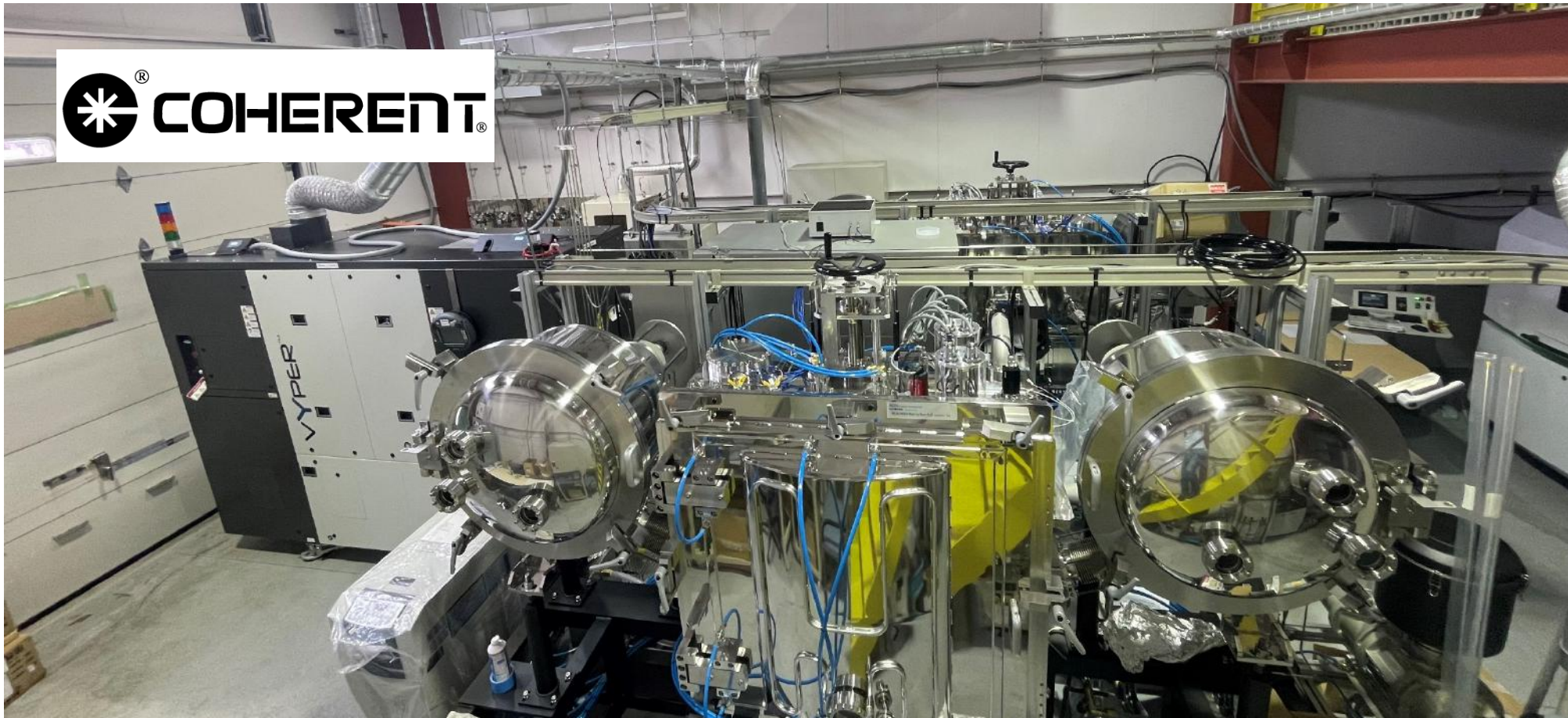
Potential to reach 1GA-m/year capacity with **10 units**



Next-gen production unit (600W laser + 2 chambers)

**IF FARADAY
JAPAN FACTORY**

COHERENT



February – received equipment, April – started operation
If R&D successful, there's potential to reach **1 GA-m/year with only 5 units**

Excimer lasers

	Tube Warranty	Tube Expected LT	Windows Warranty	Front and Rear Optics Warranty	Gas Warranty
LEAP 130C	2 bn	4 bn	100 Mio	1.5 bn	≥ 30 Mio
LEAP 150C	4 bn	8 bn	100 Mio	1.5 bn	≥ 30 Mio.
LEAP 300 C	5 bn	10 bn	100 mio	1.5 bn	> 50 mio

Several LEAP lasers operate for > 15 bn pulses !!!

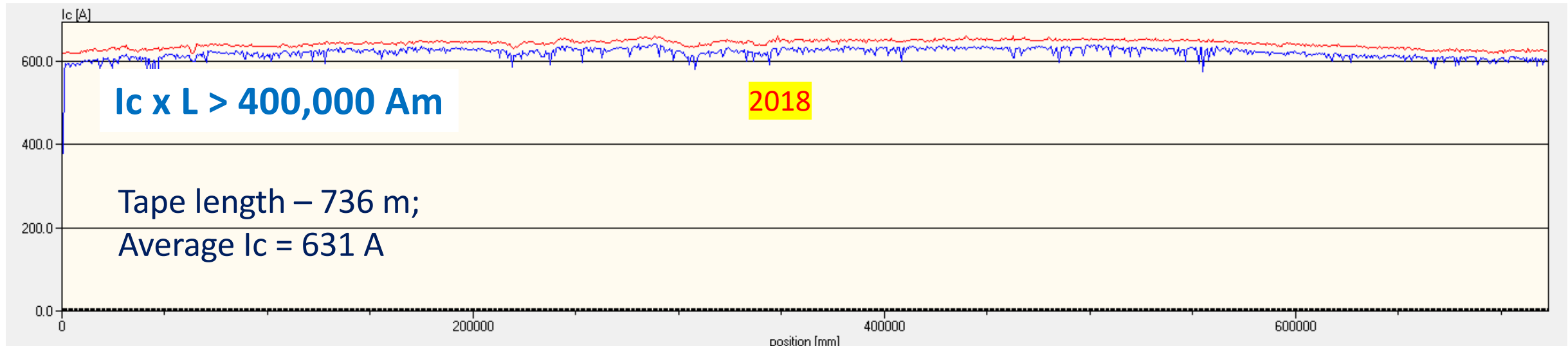


Scaling up PLD major raw materials (PLD targets)



R&D focus: Optimization of target size and sputtering
Repolishing and Recycling
Production in house

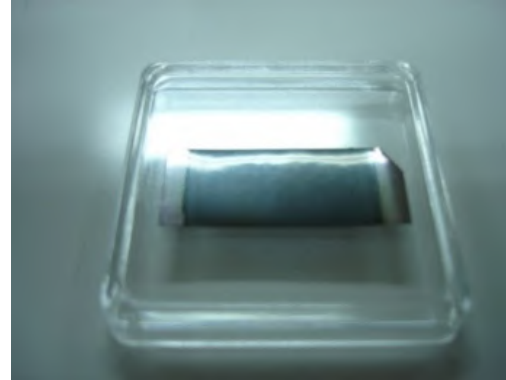
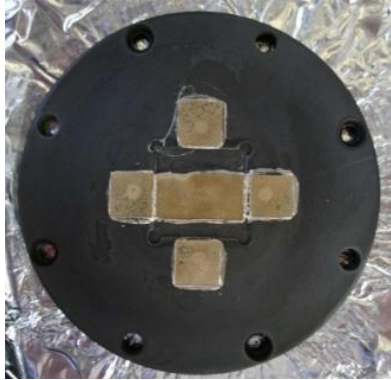
Maximum production length and $I_c \times L$ performance



To reach 0.4GA-m/year capacity - 1000 tapes will be required
For 1GA-m/year - 2500 tapes per year

In 20 years from 1 cm² wafers to 500 km batch

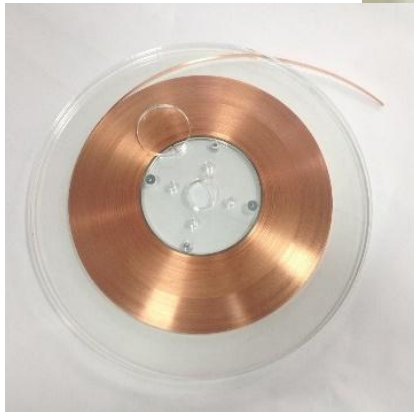
2003



2013



2018



2023

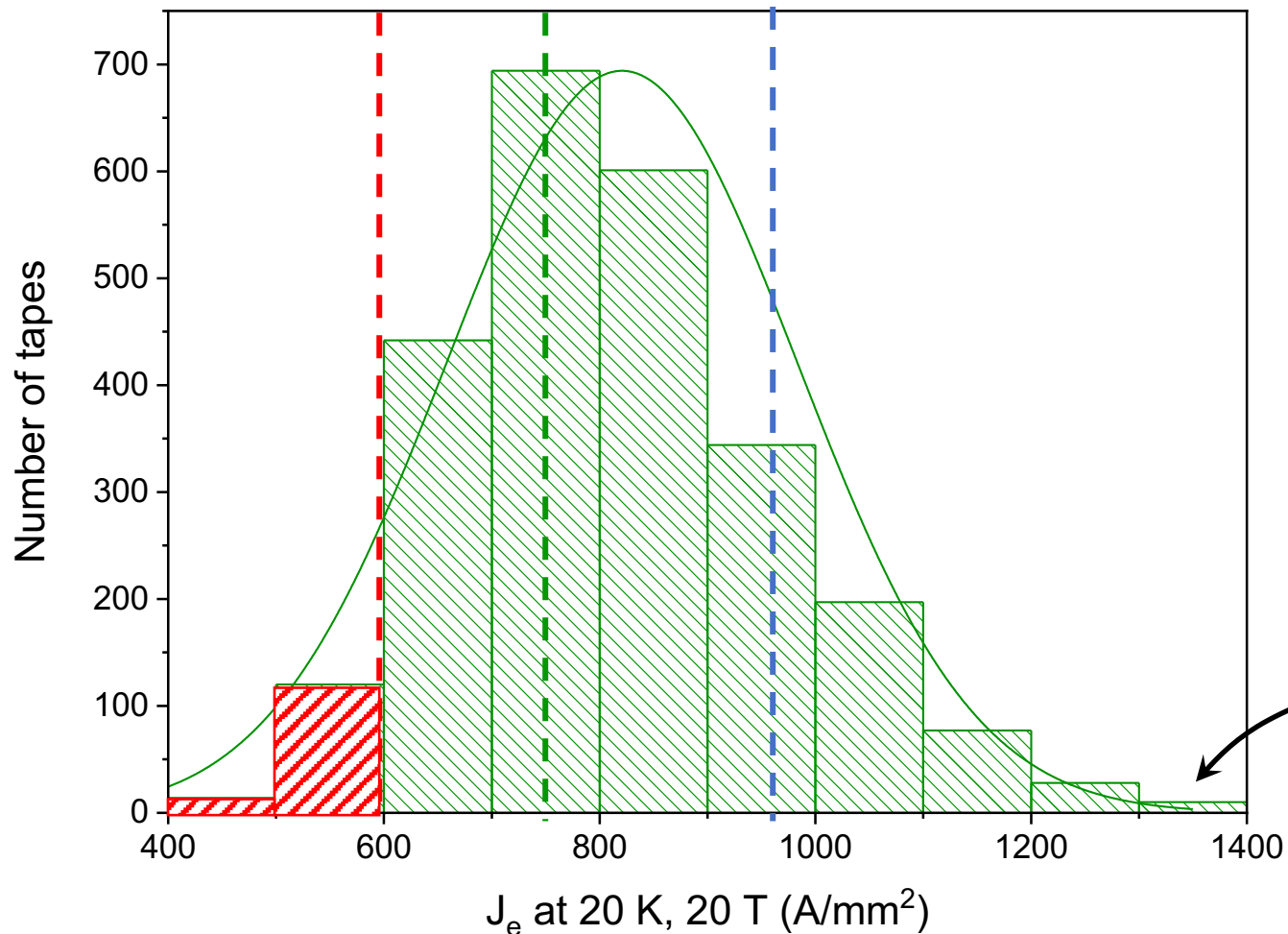


FFJ HTS tapes for fusion: large-scale supply

Min $J_e \geq 600 \text{ A/mm}^2$
5% < min

Av. $J_e \geq 750 \text{ A/mm}^2$

Av. $J_e \geq 980 \text{ A/mm}^2$
delivered in 2022



Actual measurement results shown

~ 1000 km of tape on plot

3000+ km of tape supplied:
statistical QA, sampling tests

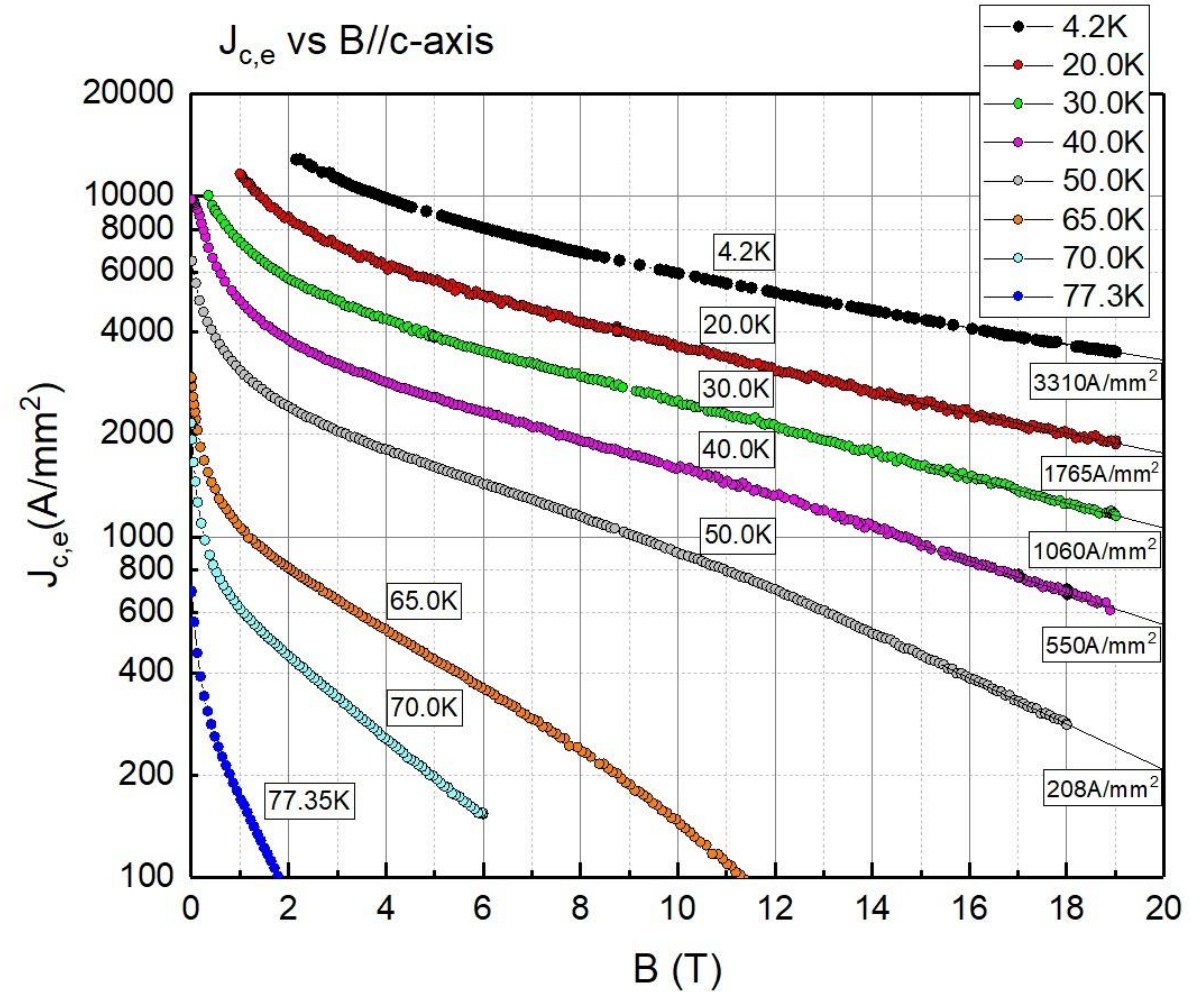
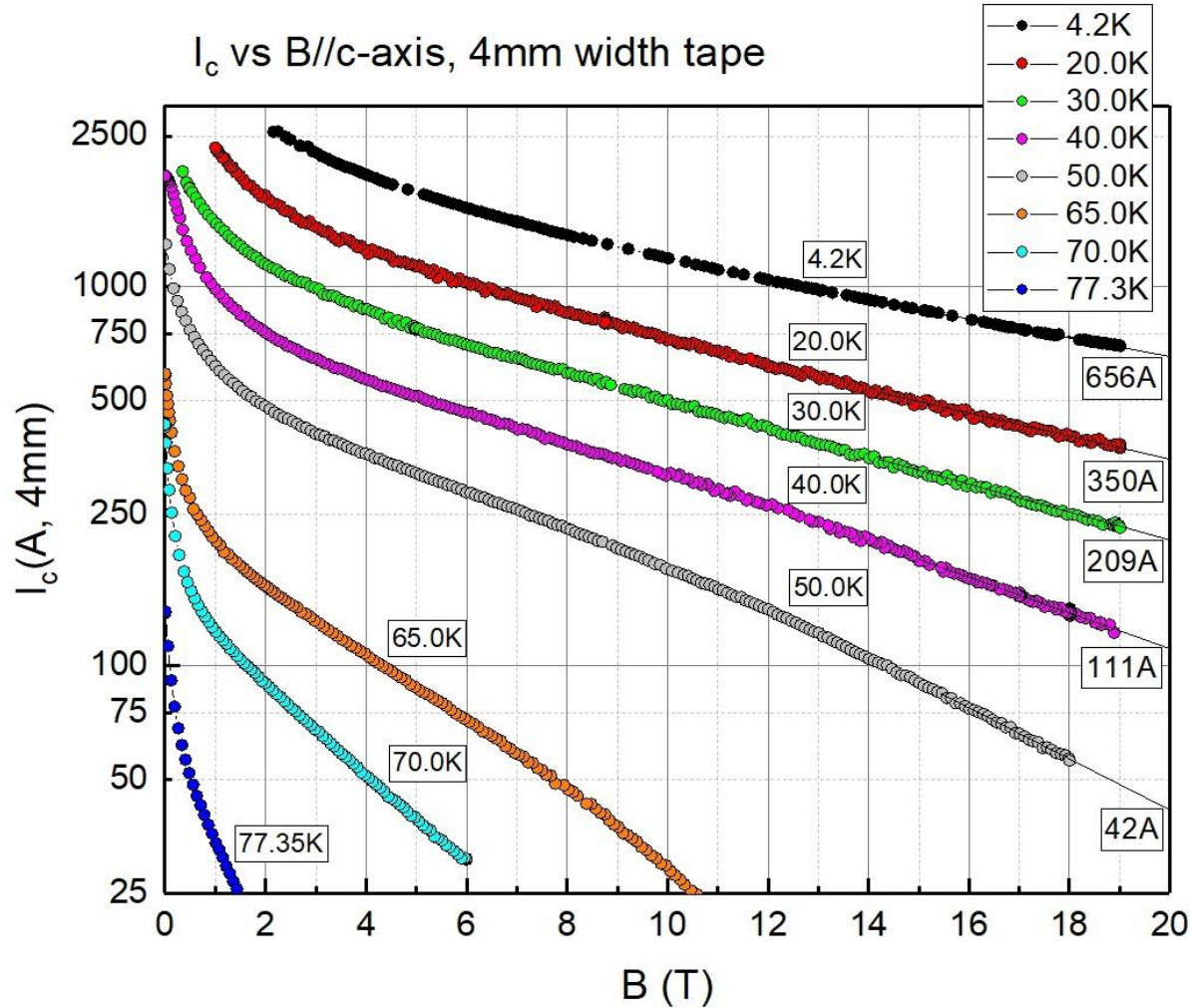
R&D in progress



new chemistry
superior processing
cost reduction

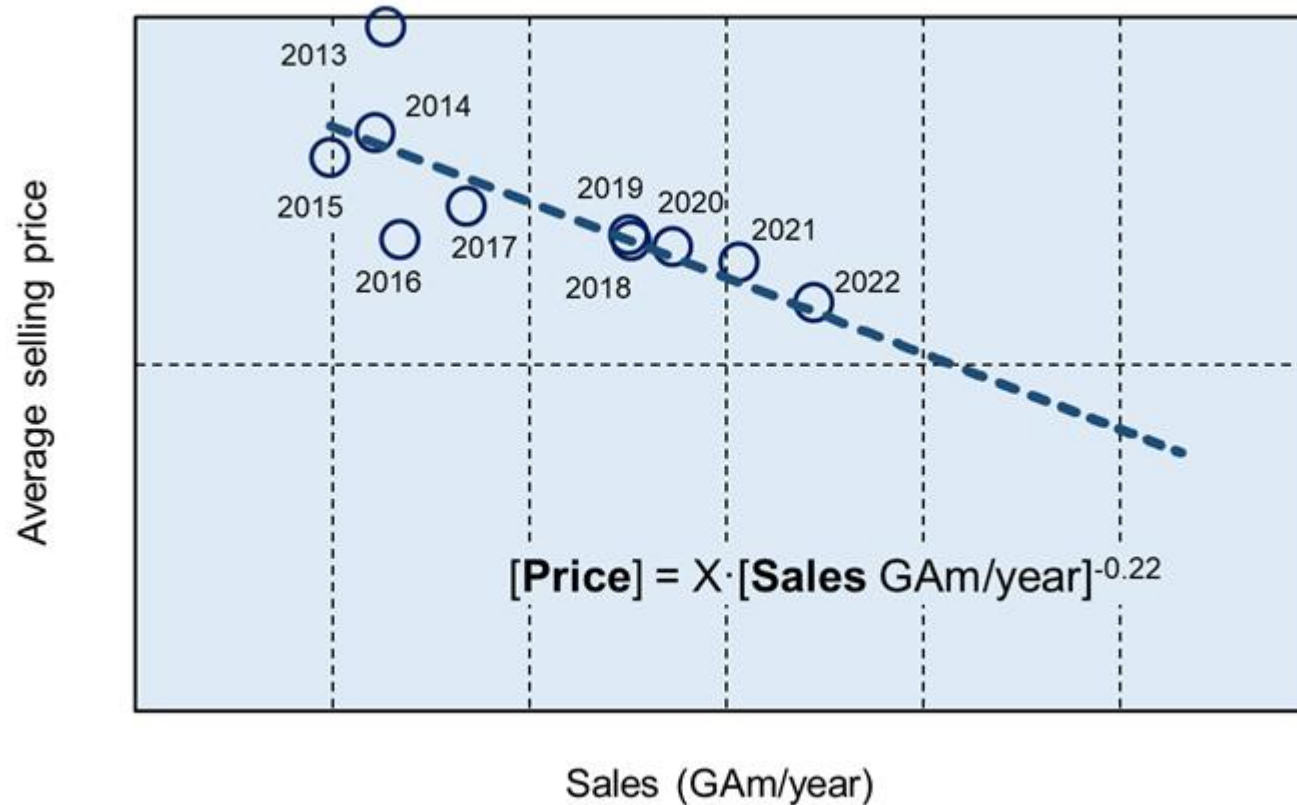


Excellent state-of-the-art in-field properties



New tape performance almost doubled compared to the standard production process
 I_c (20K,20T) >350A/4mm, J_e (20K,20T) >1700A/mm²

Learning curve: more production → lower price



- Fusion creates demand, promotes capacity; large volume drives the cost down
- HTS price will catch LTS with another 10-fold volume increase
- Other applications will benefit (accelerator magnets, cables etc.)

FFJ occupies 2,000 m², employs 50, operates 24/7

Hashimotodai



Hashimoto



TechnoEast, Kamimizo

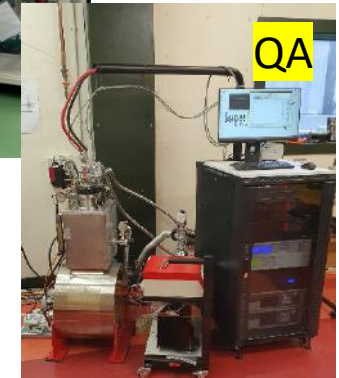
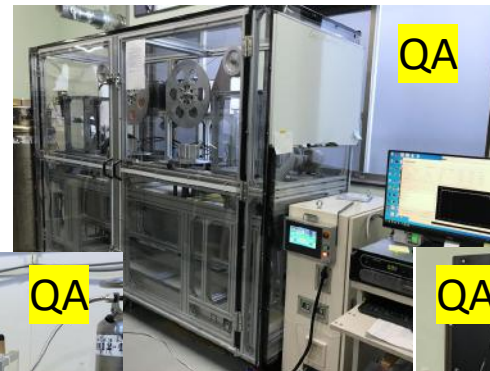


SIC-3, Kamimizo



Kita-Hachioji

New equipment for 2023 scale up is arriving



Multi GA-m factories vision (mid-2020's)



Fits well into standard logistics center

2500 m² unit **0.5 GA-m/ year**

5000 m² unit **1.0 GA-m/year**



We are up to build more modular plants as demand unveils

Acknowledgement to FFJ team



**Growing team of over 50 people
from 7 countries**

Creative, Young and Mobile