

CCA 2025, CERN
Progress in 2G-HTS Tape Development at
High Temperature Superconductors, Inc.
(HTSI)



Silvia Rasi, Rohit Jain, Richard Behiel, Ines Wyrsta, Ray Karam

The HTSI Team (~ 20 people in Santa Barbara, CA)



Rohit Jain, Silvia Rasi – REBCO experts; Richard Behiel - Metrology



Ray Karam,
CEO & Founder



Berkely Johnson,
CFO



Adam Shelton,
VP of Marketing
& Business Dev.



Ines Wyrsta,
Director of
Engineering

Acquired PVD Products, Inc. in June 2022 (Jim Greer!)



On our path to build a 500 m/hr manufacturing line

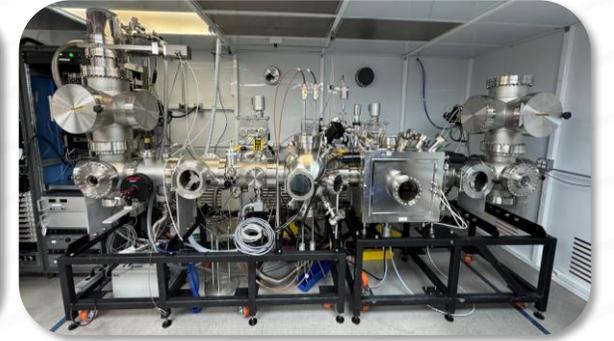
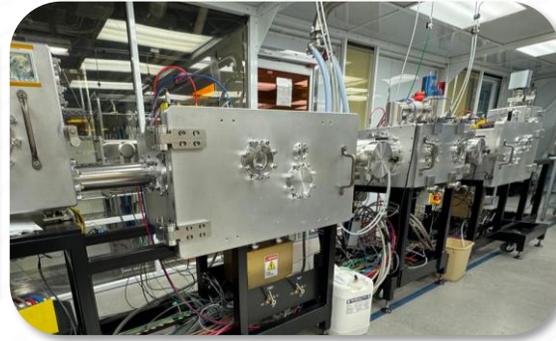
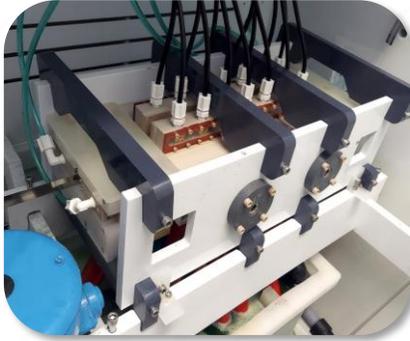
PVD
PRODUCTS

- Manufacturing reel-to-reel equipment for the HTS industry for 20 years.
- Vertically integrated

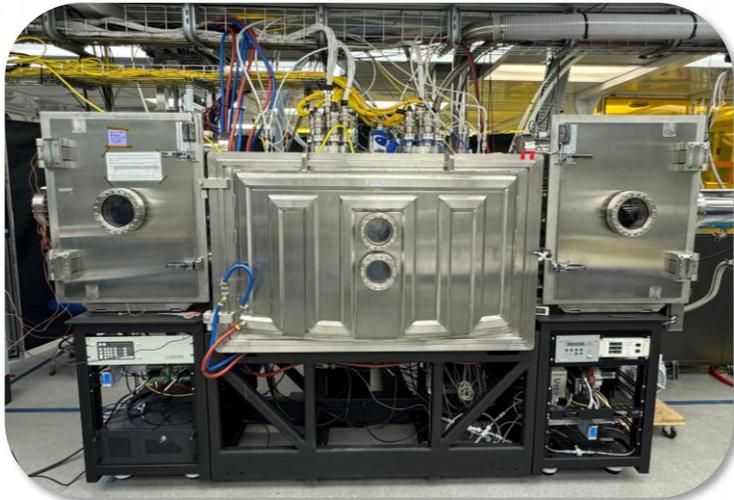
HTSI is the only 2G-HTS tape manufacturer using PLD in the U.S.

A Glimpse Into Our Santa Barbara Production Facility

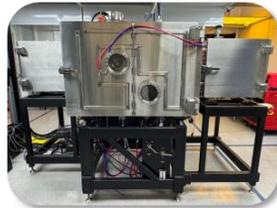
Buffer Layer Systems



REBCO PLD



Backend (Ag, Cu, Slitter, Edge)



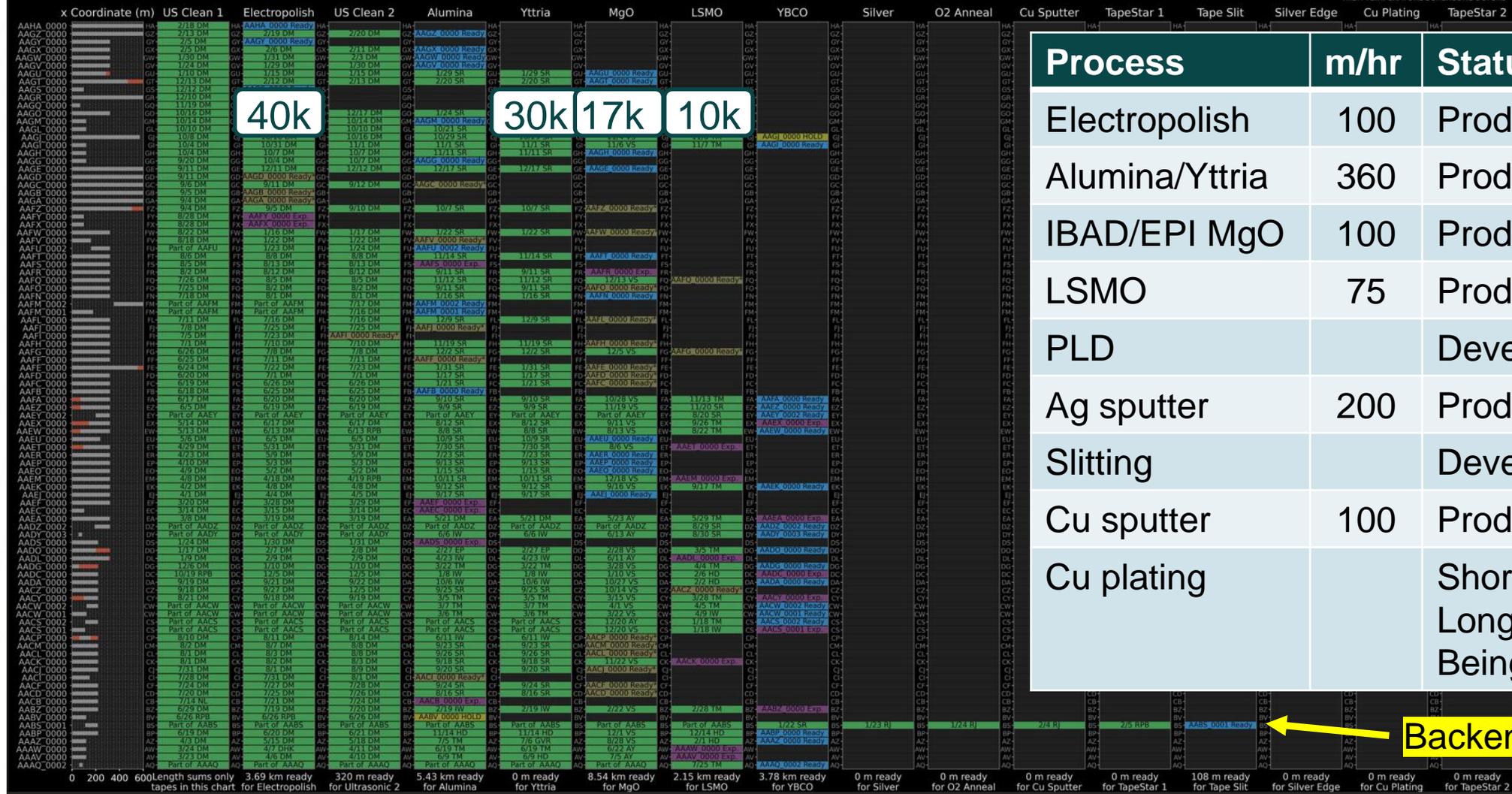
Metrology



WIP Chart Snapshot – 600 m Length, 16 mm Width (!)



~ WIP Tracking Chart ~
 Chart does not show shipped or scrapped tapes.
 Last updated: 2/21 10:00 AM

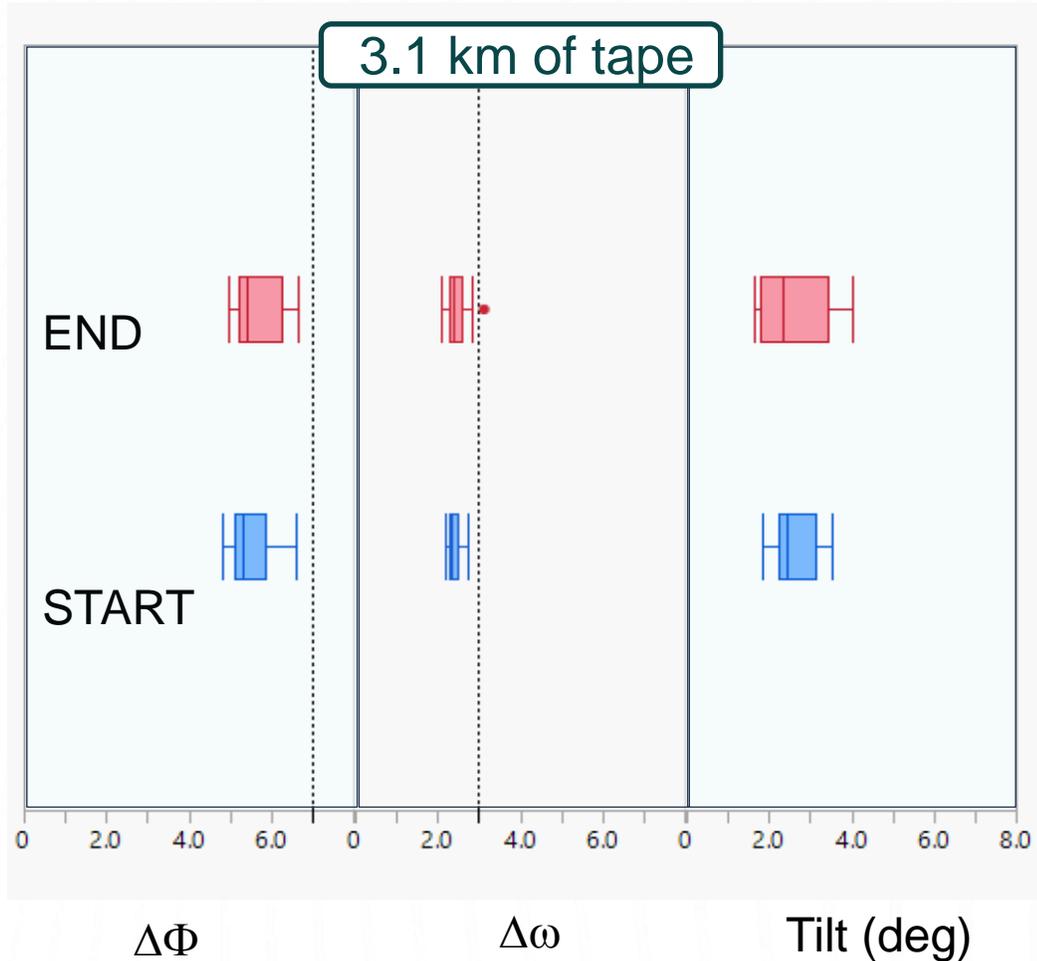


Process	m/hr	Status
Electropolish	100	Production
Alumina/Yttria	360	Production
IBAD/EPI MgO	100	Production
LSMO	75	Production
PLD		Development
Ag sputter	200	Production
Slitting		Development
Cu sputter	100	Production
Cu plating		Short length Long length out-sourced Being built

Backend



High Quality Buffer Delivered to Select Customers

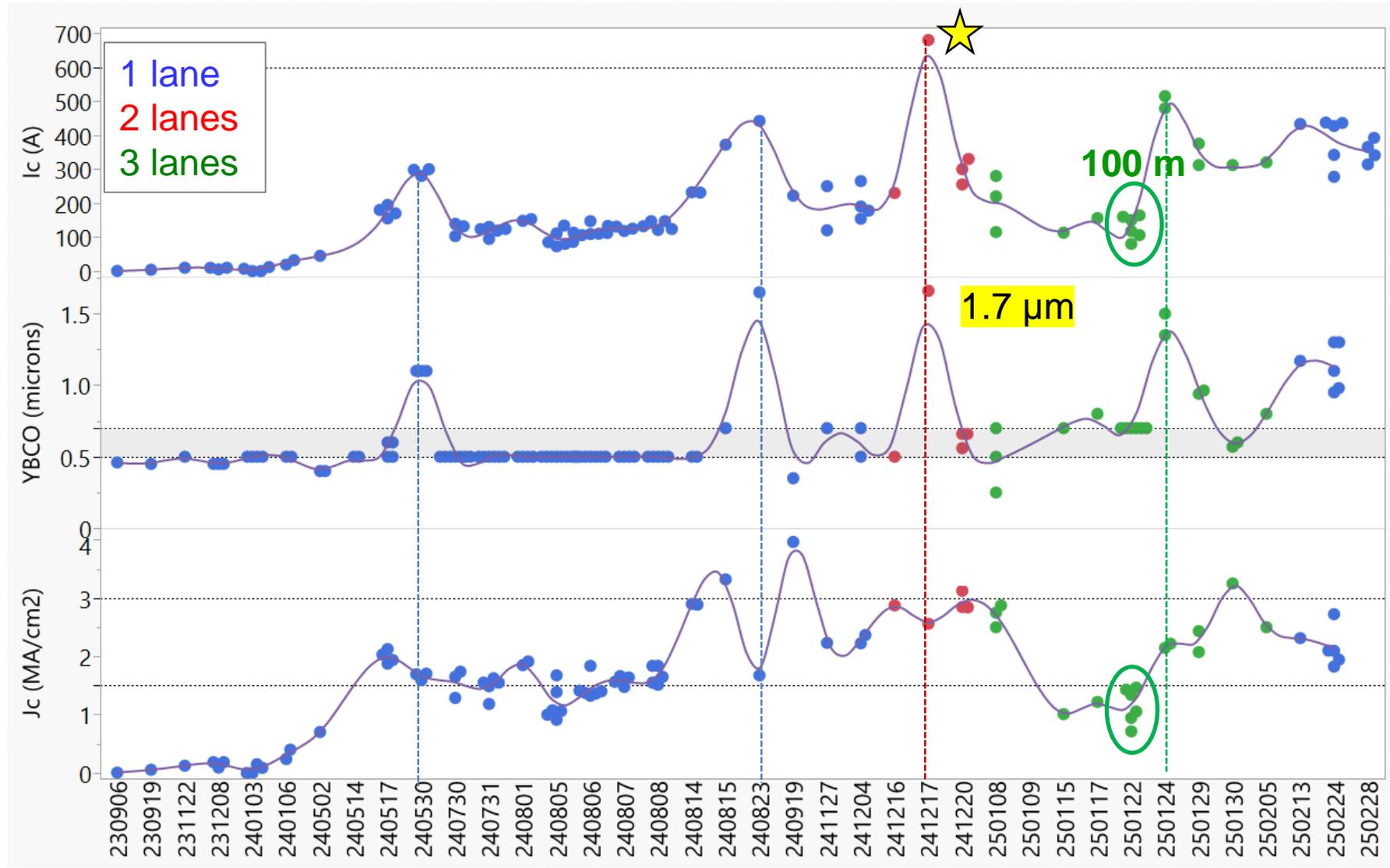


- In production. All HTSI tapes made on in-house produced buffer.
- Qualified for use with PLD and MOCVD (Selva's group!)
- Excellent adhesion.
- Delivering up to 550.

Specs for LSMO:

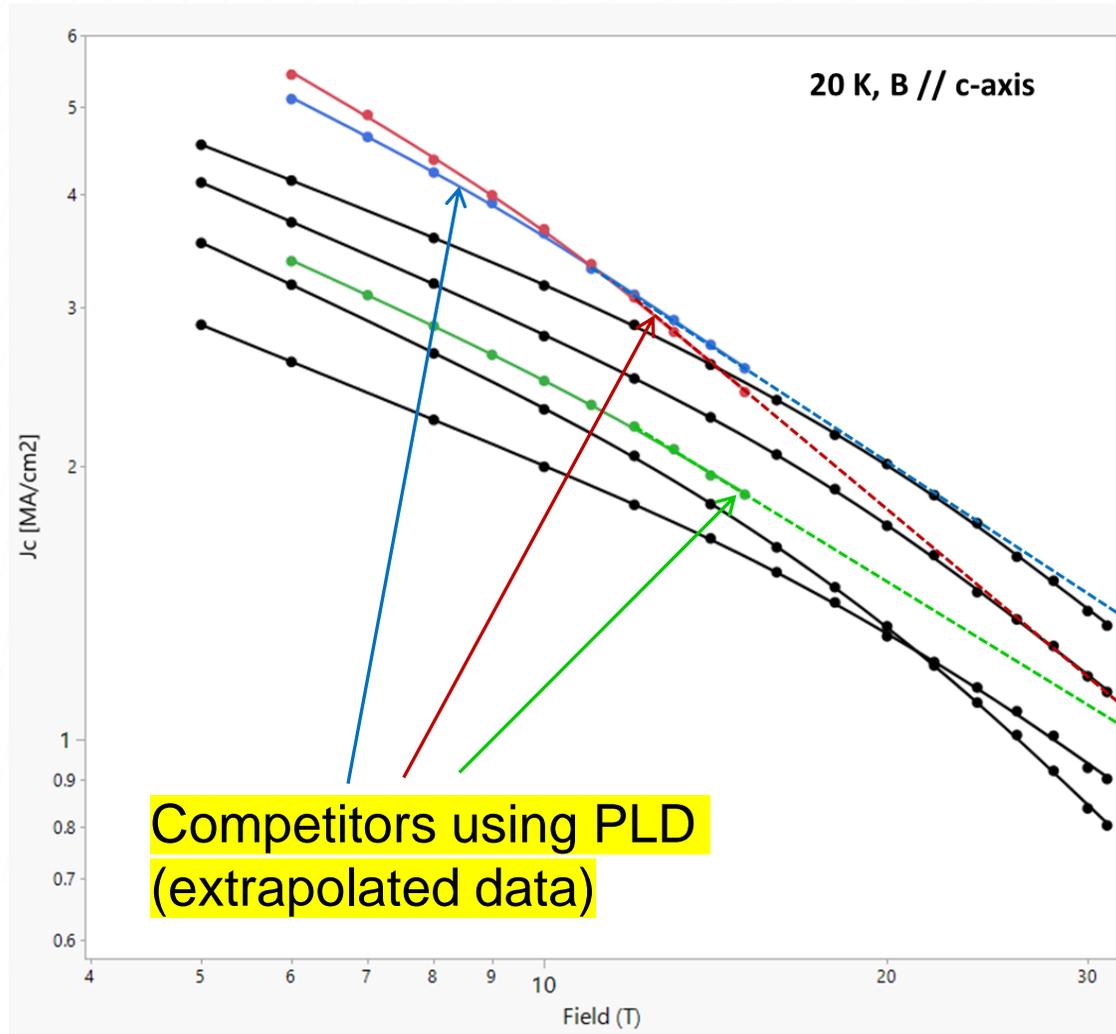
- Delta phi < 7.0
- Delta omega < 3.0
- Tilt typically $1.5 < x < 4.0$ (not guaranteed)

Transmission Wire: Transport at 77 K, s. f.



- Achieved industry spec $I_c > 150$ A for 4 mm tape
- Doubled J_c to 3 MA/cm²
- Moving to multiple lanes to increase speed and length.
- 100 m run

Transport J_c Comparable to Competitors at 30 Tesla



NATIONAL HIGH
MMAGNETIC
FIELD LABORATORY

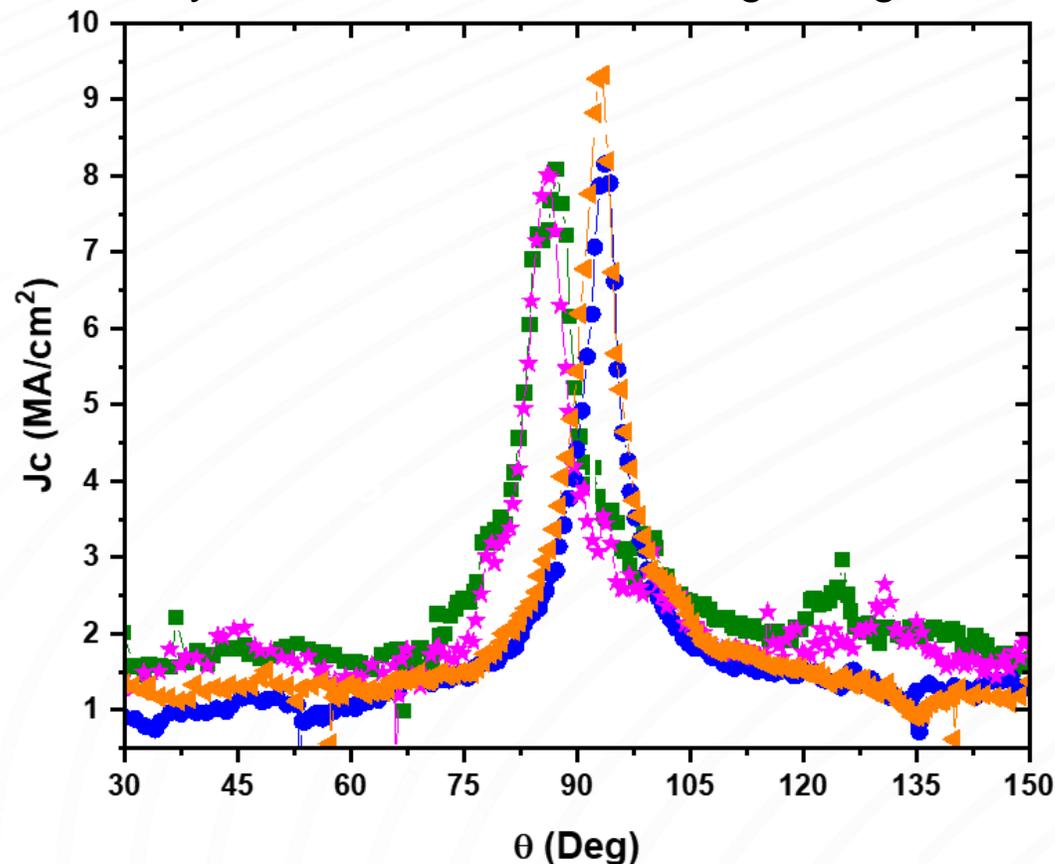
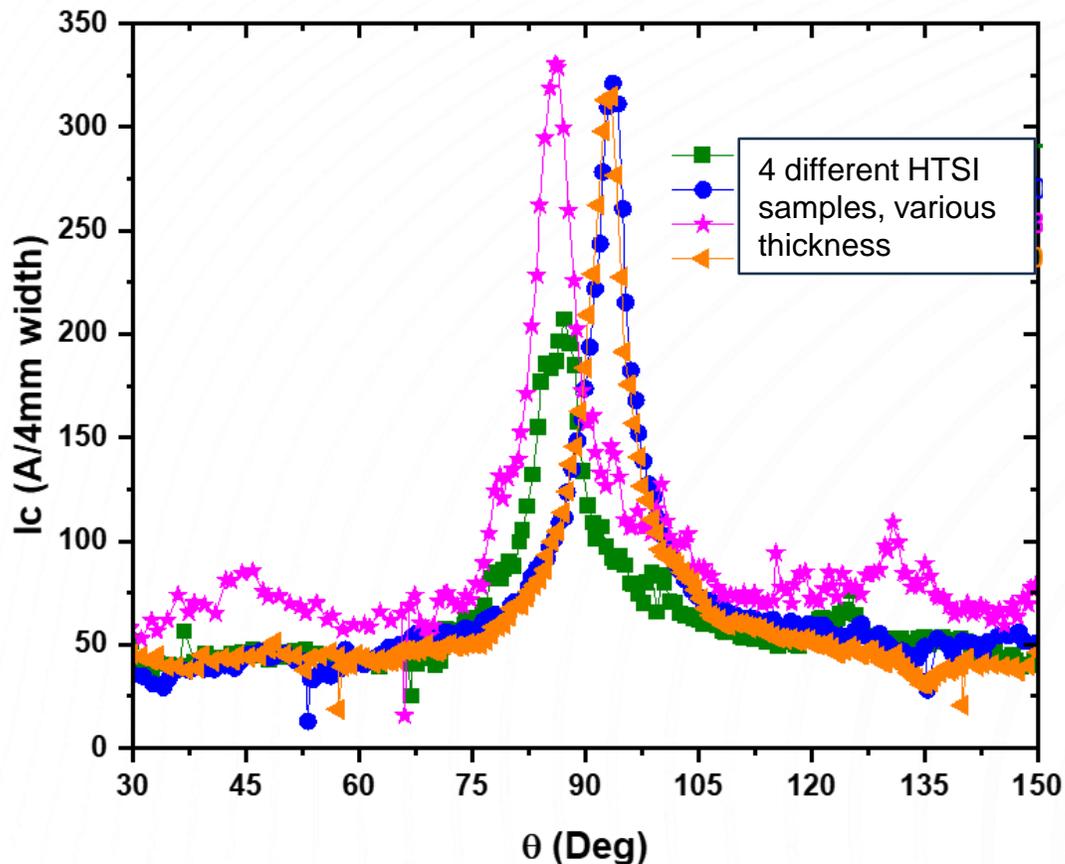
- Un-plated (thin Cu) samples survived 31 T (!)
- J_c and pinning for B // c-axis is comparable to competitors
- High Field I_c needs to improve by 2x

* Data from Aixia Xu, Jan Jaroszynski, Silvia Rasi at the High Magnetic Field Laboratory

Torque Magnetometry at 30 Tesla

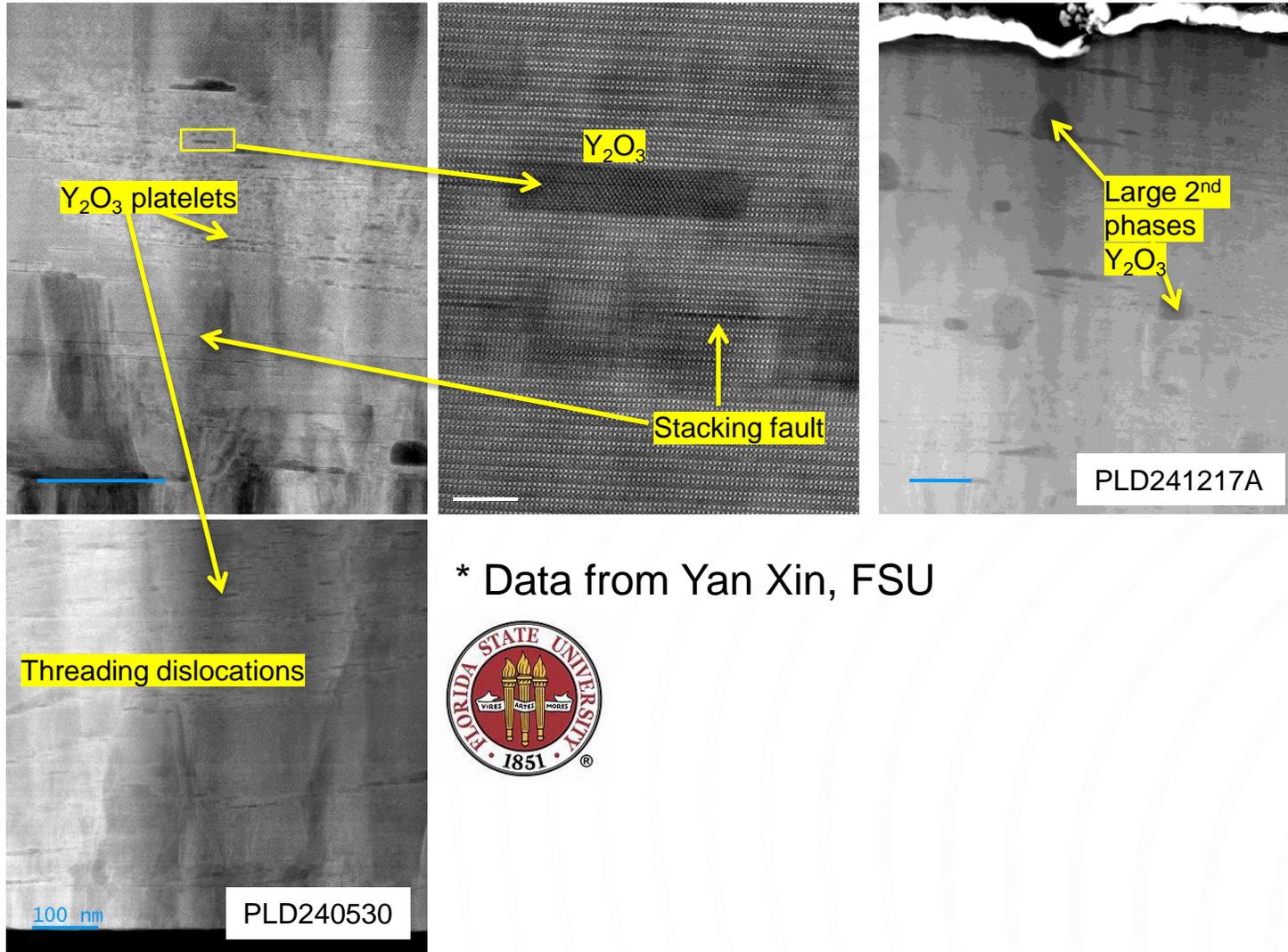


* Data from Aixia Xu, Jan Jaroszynski, Silvia Rasi at the High Magnetic Field Laboratory



- Torque Magnetometry data at 30 T confirm excellent J_c comparable to competitors and robustness with $B \parallel ab$ (magnet applications)

Nanostructure & Pinning



* Data from Yan Xin, FSU

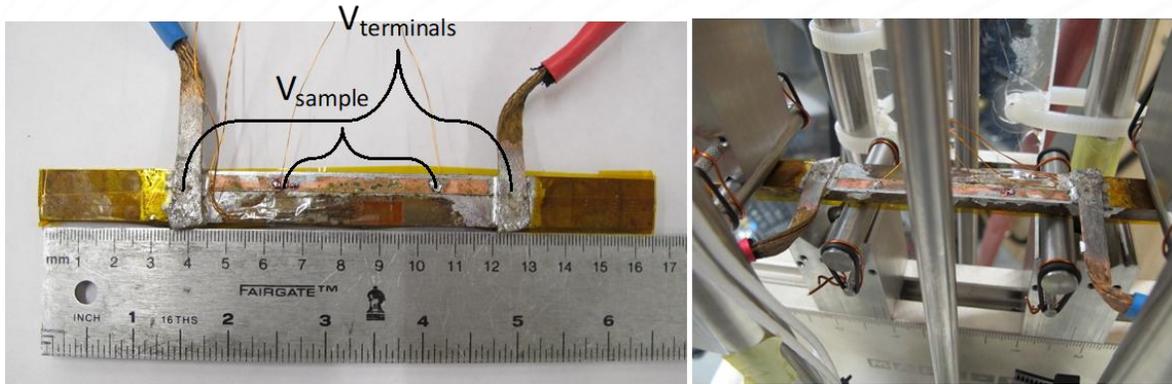


- Y₂O₃ platelets for pinning
- Stacking faults
- Threading dislocations
- Large 2nd phase regions, especially towards upper layer inhibiting current percolation → Room for improvement!

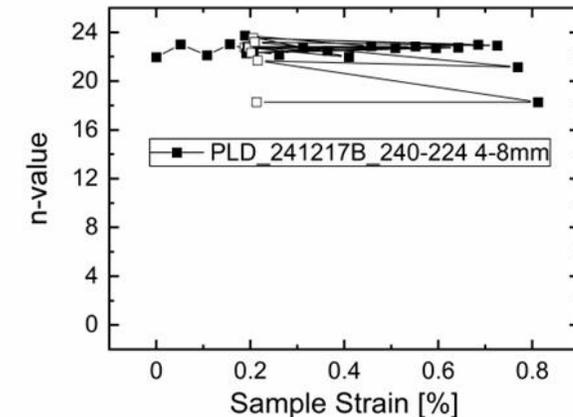
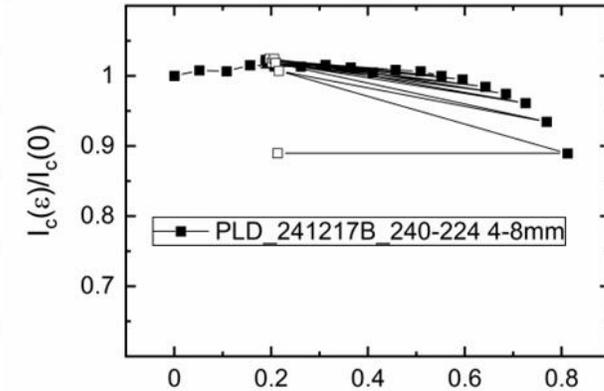
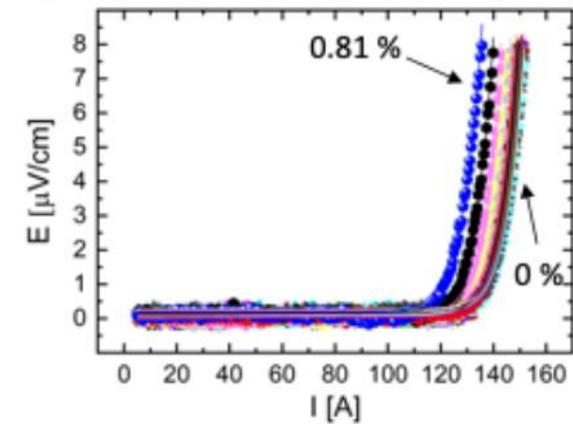
Mechanically Robust Tape



Advanced Conductor Technologies
www.advancedconductor.com



- Strain test of 4 mm Cu-plated tapes on BeCu bending beam submerged in LN2
- Achieved $> 90\%$ I_c retention for sample strain up to 0.55 - 0.75%



Buffer line in production → Ask for a quote!
Competitive current / current densities for
transmission and fusion.

THANK YOU