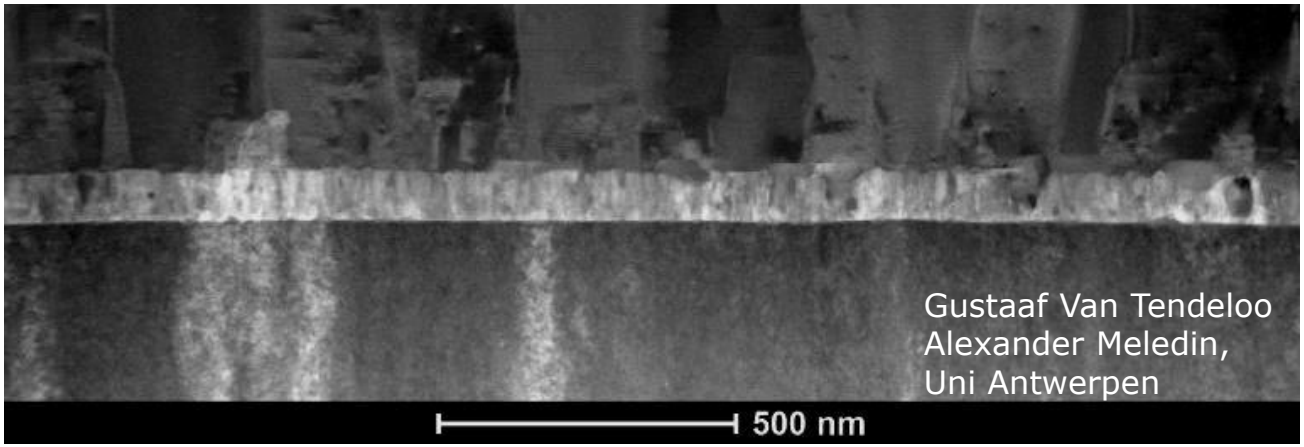
Bruker Energy & Supercon Technologies (BEST)

EUCARD2 status by Bruker HTS

CERN, 01.12.2015

Outline

- New production site
- First Ic-s in PLD600
- PLD 300
- 12mm production
  Cu, Ag, 50µm substrate tests,
- EUCARD2 plan

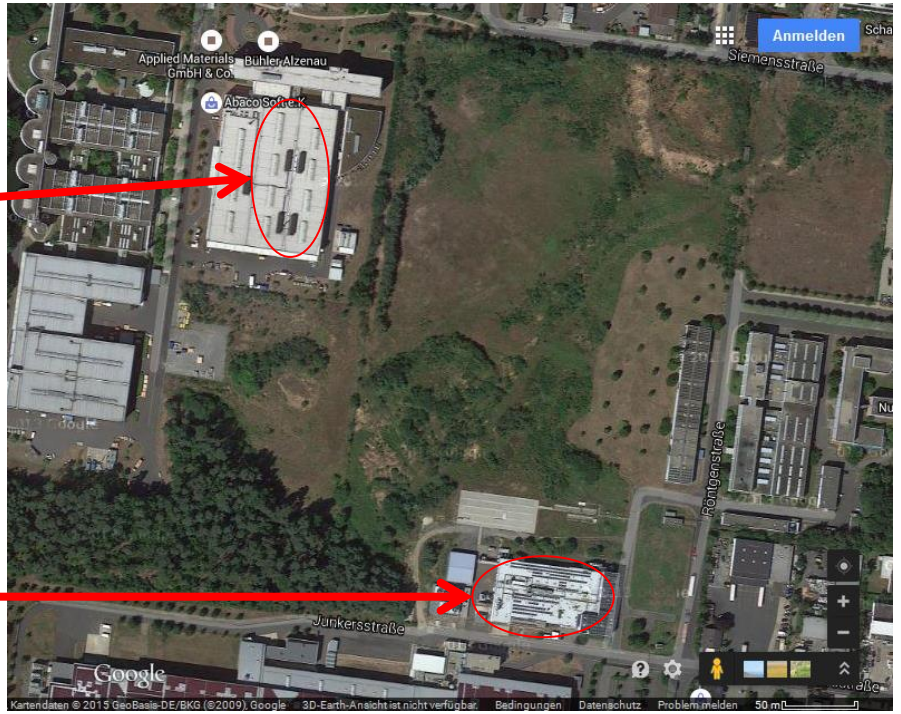


HTS PILOT-LINE PRODUCTION
ACTUAL STATUS

RELOCATION OF BHTS IN Q3 2015

current site

new site



Bruker HTS: new site

Provided by U. Betz

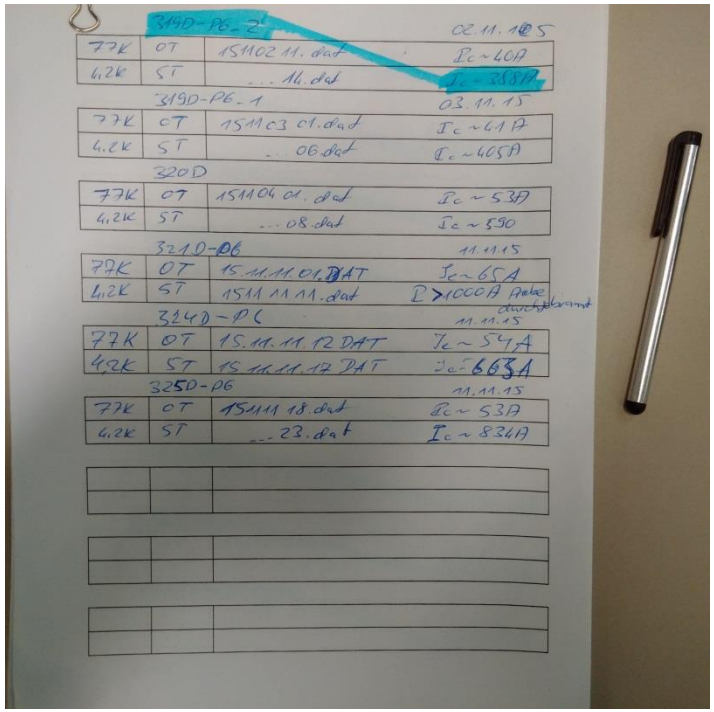
RAMP-UP AT NEW SITE

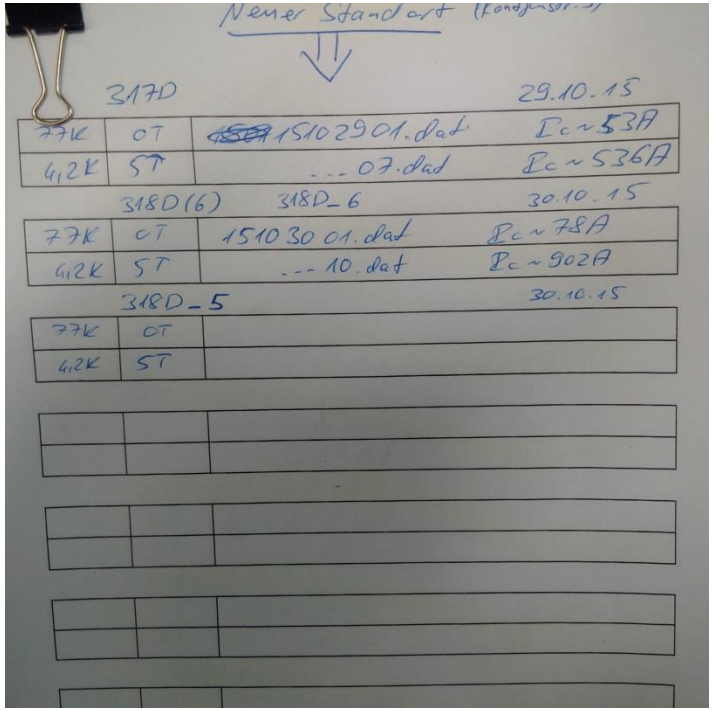
Move-out: Siemensstr. 88, Alzenau site.
- All areas were handed over to BÜHLER on Sep28th

Move-in: Röntgenstr. 9, Alzenau site
- All equipment have been placed on it's final position
- All Media supply is connected to the equipment, checking of the media quality and facility installations is in progress

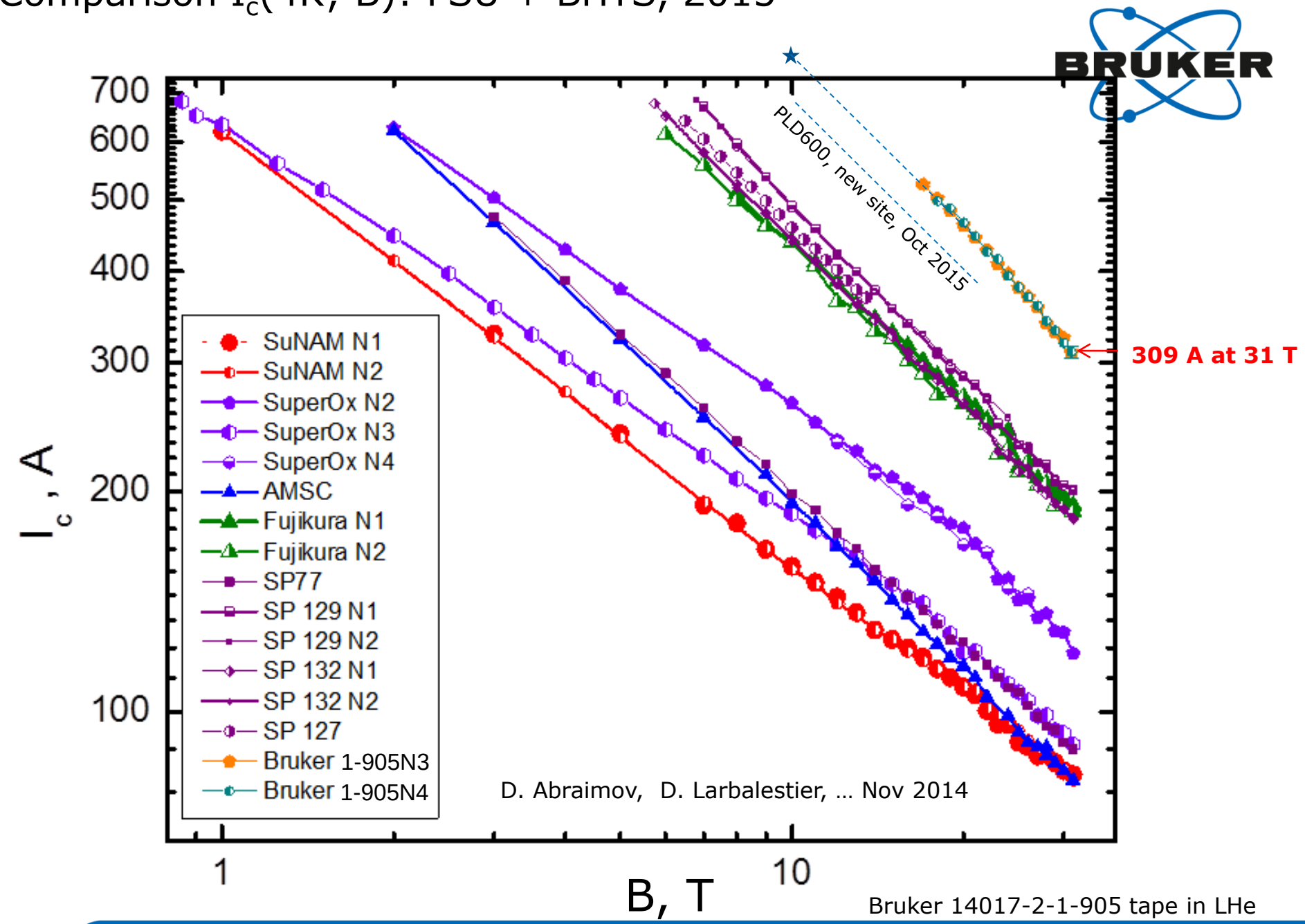
Re-start of pilot-line equipment at new site
- All equipment is operational again
- Minor technical issues have been addressed, trouble shooting is in progress
- Currently A4 test tapes are being processed at each work station to check performances
- Process fine tuning will be the next step

First short tapes with Ic =800 - 1000A at 4.2K, 5T, B//c; w=4mm

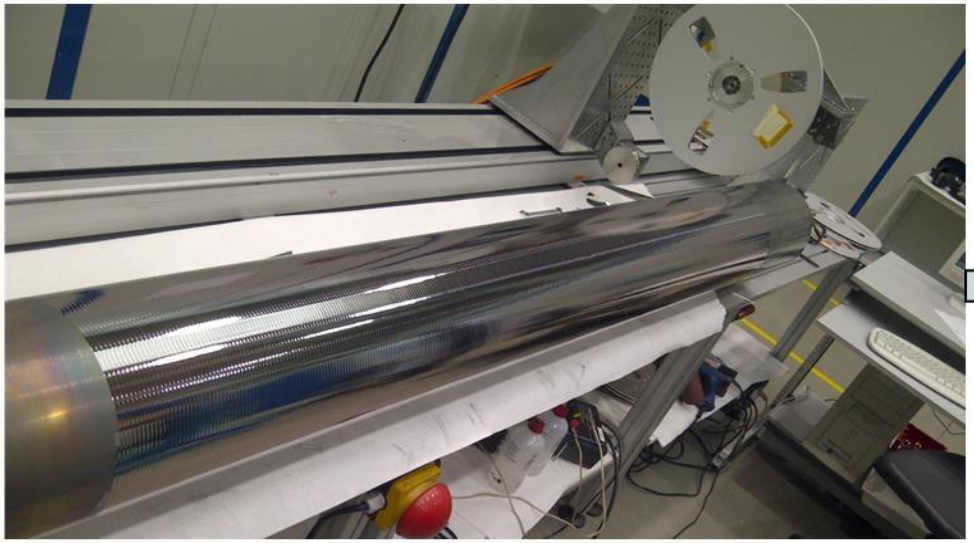


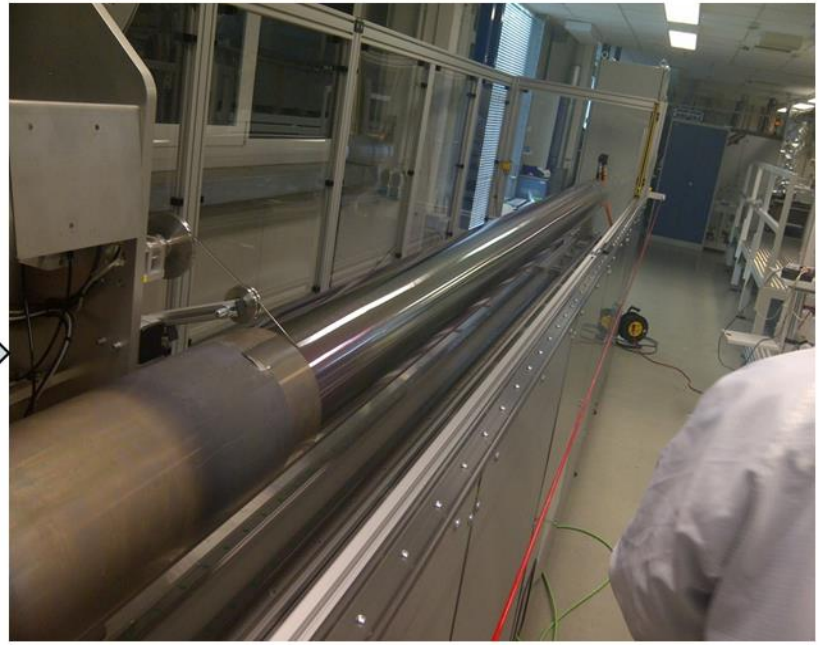


Comparison I_c(4K; B): FSU + BHTS, 2015



Up-scaling to piece length above 600 m: first deposition runs and fine tuning are in progress





223 m and 610 m long tape after deposition of HTS layer

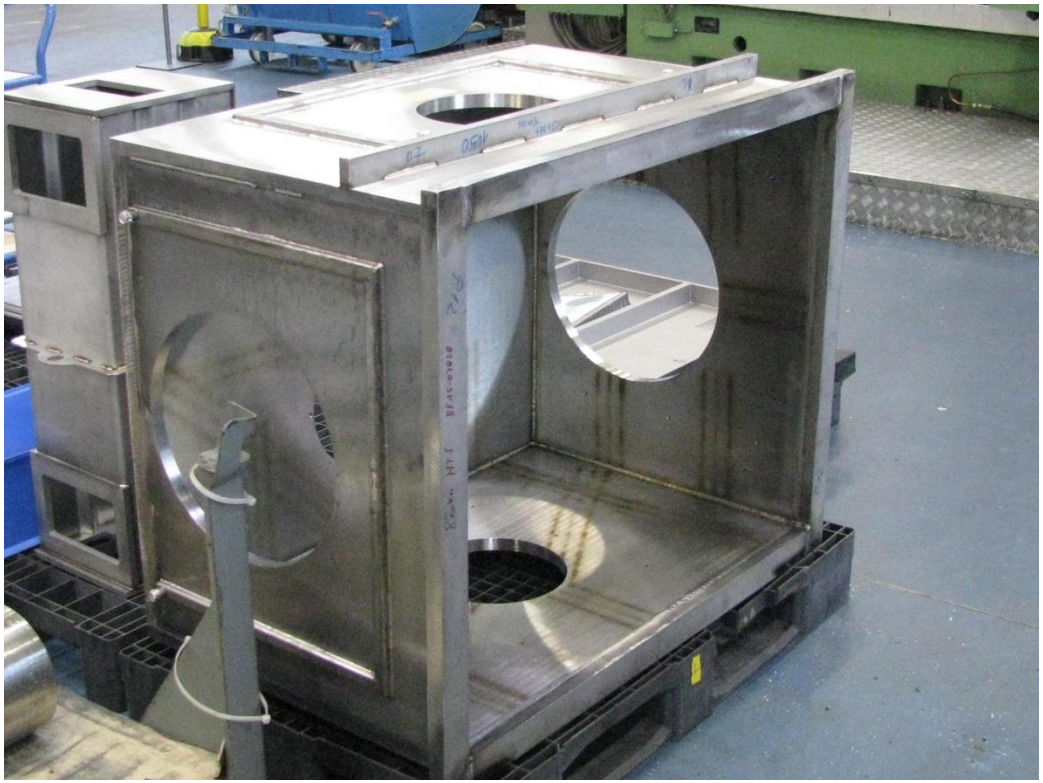
PLD2 = PLD300.

MB-PLD machine with deposition area of 0.13m^2

Available parts of PLD300

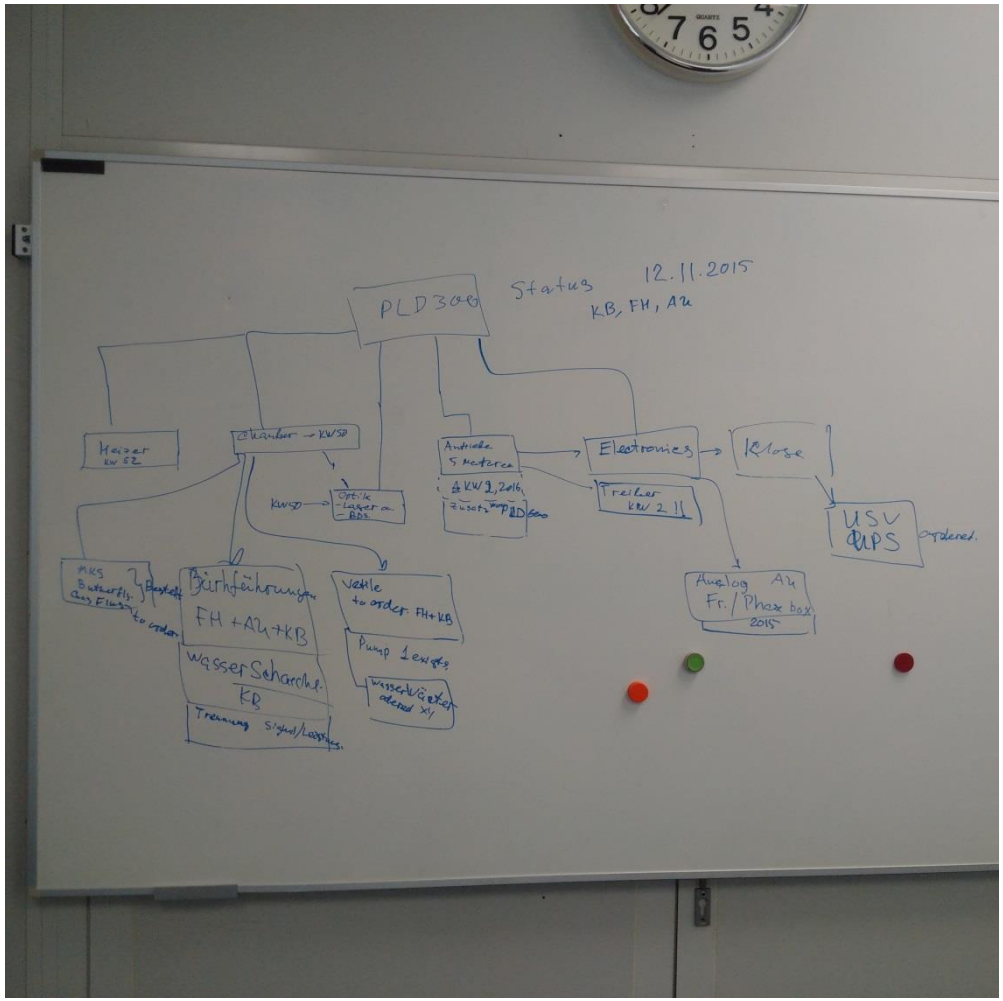
Units of PLD300

New Chamber of PLD300:
Pfeiffer Vacuum says few days needed to accomplish chamber



PLD 300: assembling (time-plan) status 2015-12-01

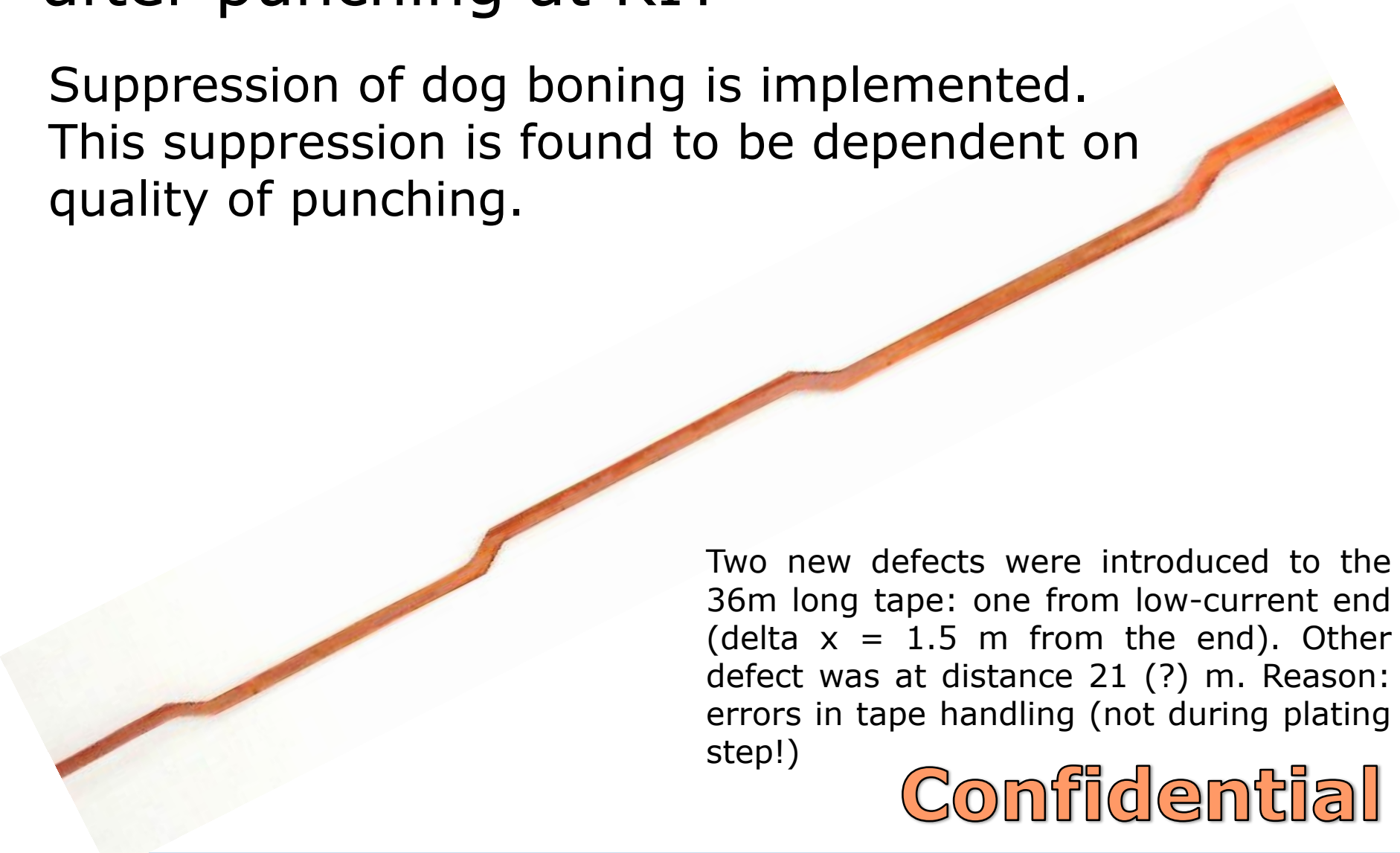
Chamber:	CW50
Optics:	CW51 (laser port) CW1 (BDS, chamber)
Assembling starts:	CW51
Heater:	CW52
Power suppls	delivered
Target unit:	CW2
Chamber accessories:	CW2
Motors, drives:	CW1
System control:	CW4



EUCARD2: 12mm production
Cu, Ag, 50µm substrate tests

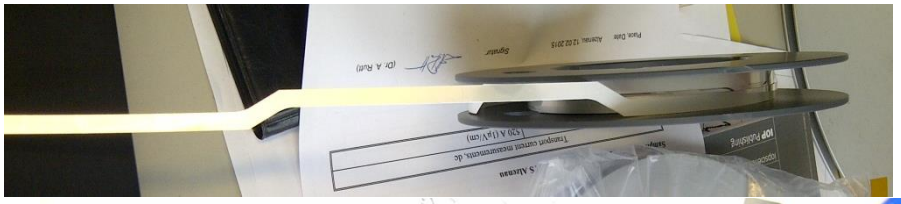
Additional protection of tape after punching at KIT

Suppression of dog boning is implemented. This suppression is found to be dependent on quality of punching.



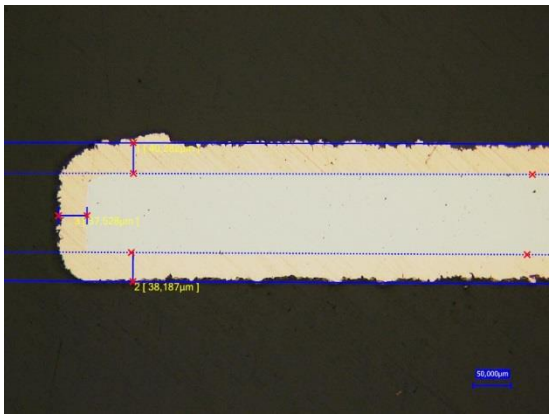
Two new defects were introduced to the 36m long tape: one from low-current end (delta x = 1.5 m from the end). Other defect was at distance 21 (?) m. Reason: errors in tape handling (not during plating step!)

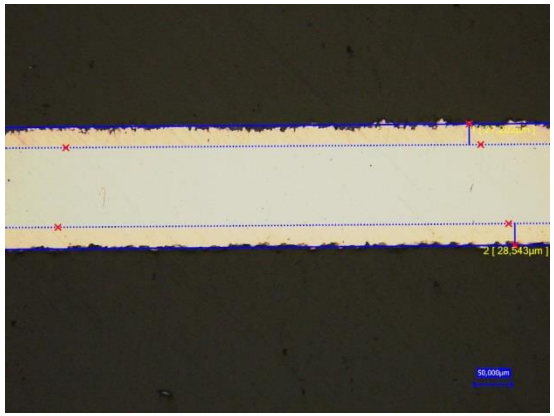
EUCARD2: SS+Ag tapes recently punched by KIT

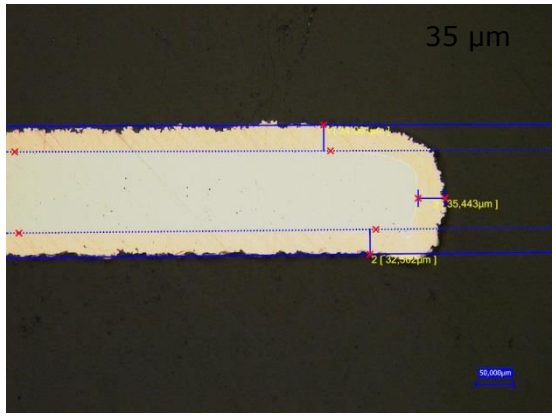


Confidential

Newest progress in suppression of dog-boning: is important in case of meander-punched tapes



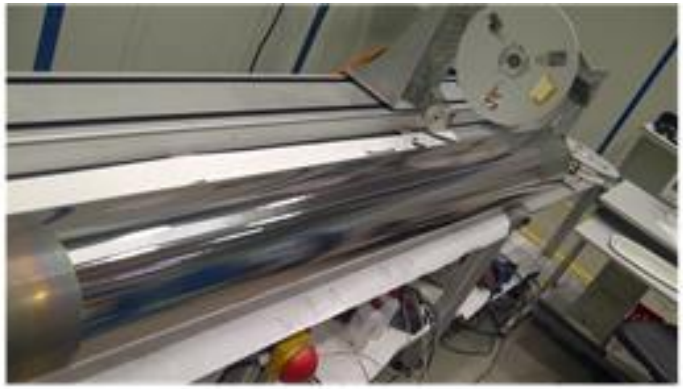




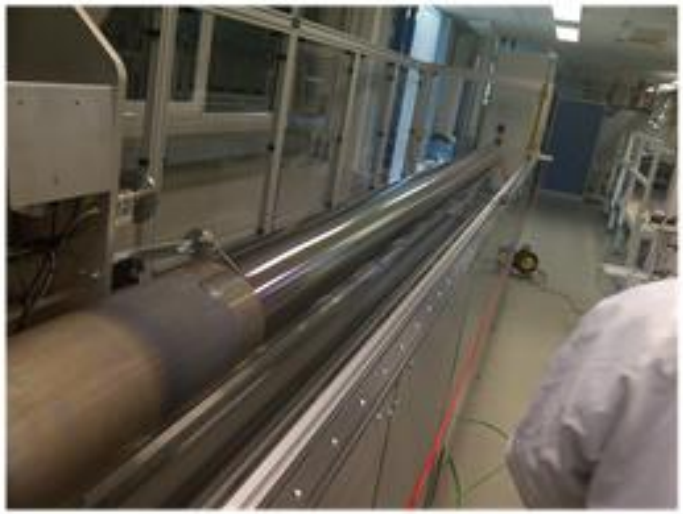
Cu thickness: 27µm in the middle
38µm at the edge

Confidential

First 610m long tapes (w=4mm) processed in PLD600 (May-June 2015)



(a)



(b)

Fig. 2. 230m (a) and 630m (b) long tapes after YBCO deposition. Tapes are helically wound on drums with 2m and 5 m length.

EUCARD2 plan in WP10 + suppl. order

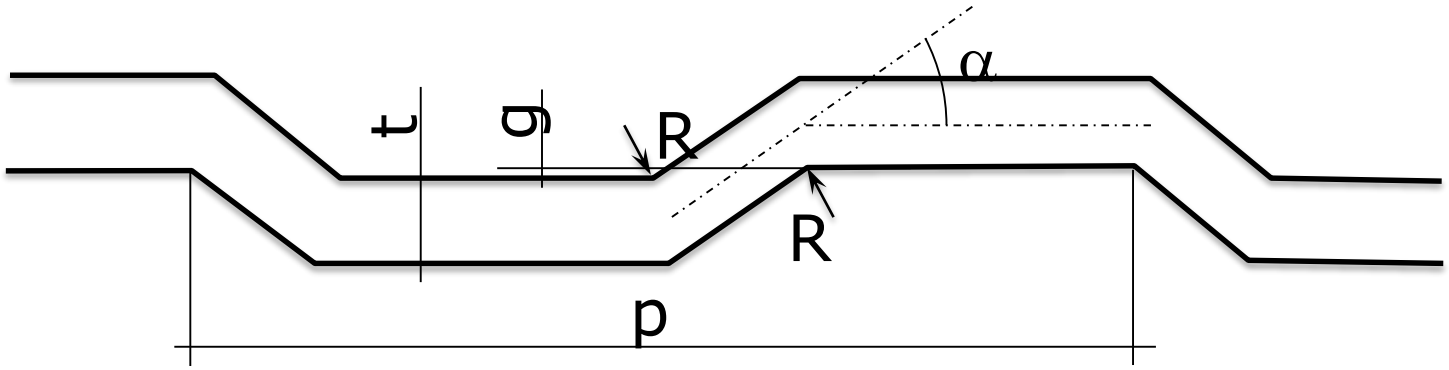
Jan 150m
Feb 250m
Mar 280m
Apr 280m
May 280m

WP10: REBCO Tapes: Cern specs Nov. 2015

- Tape parameters
  - Tape width: 12 mm
  - Tape thickness: 0.1 mm (SP, SuperOX, Sunam) … 0.14 (BHTS) mm
  - Electrodeposited copper layer (after punching): 2 x 20 μm
  - Engineering current density (20 T, 4.2 K) > 400 A/mm^2 (target 600 A/mm^2)
  - Critical current (20 T, 4.2 K) > 500 A (target 670 A)
  - Unit length: minimum 50 m (> 30 m needed for magnet construction)
    - UL for Aligned Blocks: 20 m (1.2 mm thick cable) to 28 m (0.8 mm thick cable)
    - UL for Cos Theta: 17 m (1.2 mm thick cable)

Cut tape geometry

- Optimal geometry as defined by KIT



t = 5.9 mm
g = 0.2 mm
α = 30 °
p = 300 mm
R = 1...2 mm

Summary

- BHTS is transferred by 100% to new building.
  Installation works with equipment are in progress.
  Installation and commisioning is practically completed.
  Fine tuning of process parameters: 2015

- New equipment for 12 mm tape is ordered in the end of August. New PLD300 will be assembled in 2015; will be put in operation in the beginning of 2016.

- Suppression of dog boning is implemented. This suppression is found to be dependent on quality of punching.

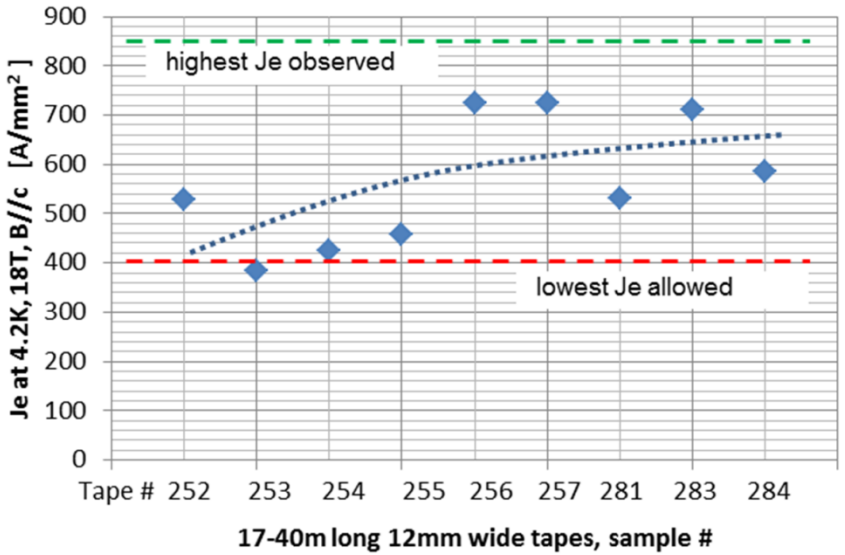
12mm wide tape technology for EUCARD2 CERN

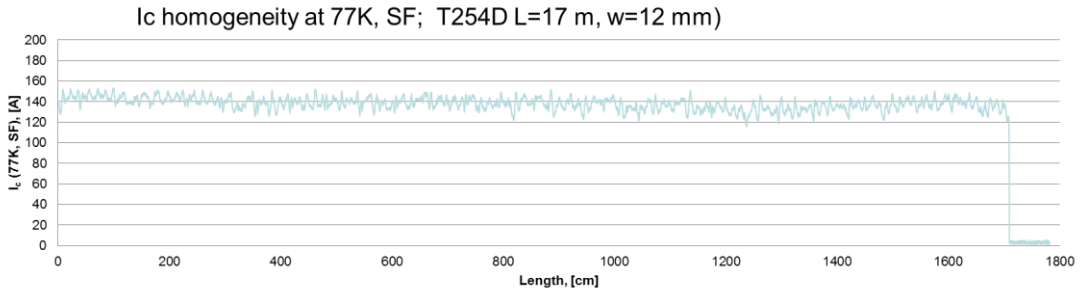
VISIT POSTER 3A-WT-P-02.03

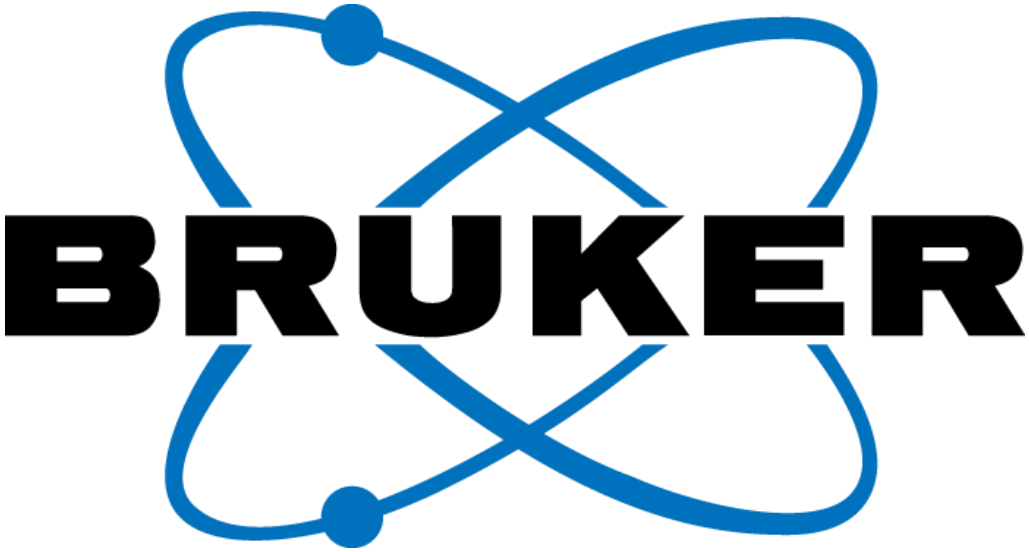
BHTS manufactured several 12mm wide tapes for EUCARD2, CERN

The high field performance (18T) was checked, a minimum Je of 400 A/mm^2 @ 4.2K/18T is required for the C12 tapes

EUCARD-2: 12mm wide tapes fabricated by BHTS



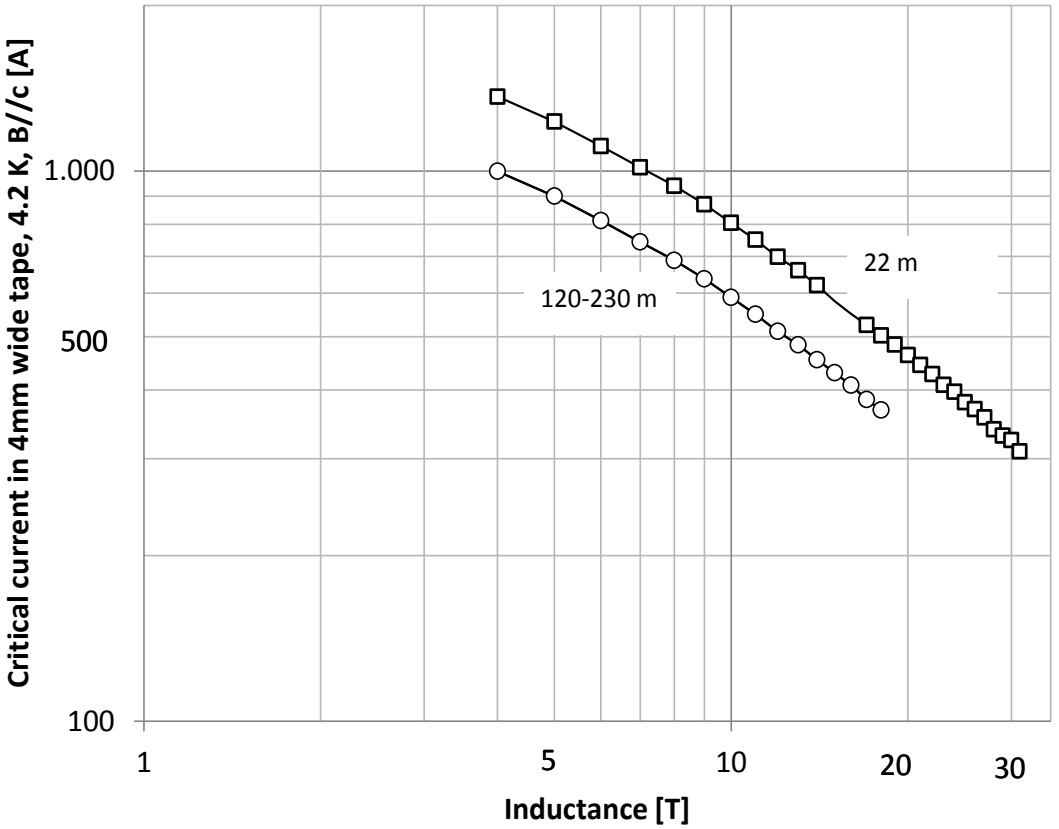




Innovation with Integrity

Supporting foils:

Ic(B) in different piece lengths (4.2K, B//c)



I_c(B) at B perpendicular to tape surface measured in liquid He. Coated tapes are 4 mm wide tape with 45 µm thick Cu plating. YBCO thickness corresponds to 1.5-2 µm. Fractions of the 22 m long batch of best quality was measured in wide field range at FSU/NHFML, Tallahassee (D. Abraimov, 2014). Measurements of fractions of 120-230 m long batches of average quality were performed by Bruker HTS/Bruker EAS, Alzenau/Hanau. The n-values measured were in between 42 and 52.