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





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



| 774 07 , 6,24 57 , 3,190-P 774 cT , 4,24 57 , 320D 774 cT , 320D 774 cT , 4,24 57 , 324,0-4 79K 07 , 1,24 57 , 324,0-7 , 4,24 57 , 3250-P 7,24 07 , 4,24 57 , 4,24 57 , | 51102 11. dad | Вс~40А 03.10.15 540 Р 540 Р 5405А Бс~53А Бс~53А Бс~536 1.115 365A С >1000А Ане окова 155 1 |]]] |
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| | 3180 (6 | 5) 318P_6 | 30.10.15 |
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| GIZK | ST | 10. dat | Pc~ 902A |
| | 318D- | 5 | 30.10.15 |
| 7710 | OT | | |
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Comparison $I_c(4K; B)$: FSU + BHTS, 2015 B RUK 700 600 500 Site Oct 2015 400 SuNAM N1 300 309 A at 31 T •— SuNAM N2 SuperOx N2 —t — SuperOx N3 200 AMSC o -A-Fujikura N1 →▲— Fujikura N2 ---- SP 129 N2 SP 132 N1 -SP 132 N2 100 -•- SP 127 - Bruker 1-905N3 -•--- Bruker 1-905N4 D. Abraimov, D. Larbalestier, ... Nov 2014 10 В, Т Bruker 14017-2-1-905 tape in LHe

EUCARD2, Bruker HTS, CERN, 01-12-2015

Bruker HTS

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

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Available parts of PLD300





Units of PLD300





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Bruker HTS

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













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

EUCARD2, Bruker HTS, CERN, 01-12-2015

Bruker HTS

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





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



Bruker HTS

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



(a)



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



(b)



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 μ m
 - Engineering current density (20 T, 4.2 K) > 400 A/mm² (target 600 A/mm²)
 - 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

$$g = 0.2 \text{ mm}$$

R = 1...2 mm

a

р

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/mm² @ 4.2K/18T is required for the C12 tapes

EUCARD-2: 12mm wide tapes fabricated by BHTS







Innovation with Integrity



Supporting foils:

EUCARD2 , Bruker HTS, CERN/01-18-2015

Bruker HTS

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.

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