

## Notes from WP10.2 meeting 31/8/2015

Participants: A. Usoskin, R. Dietderich (Bruker HTS), A. Kario, S. Otten, W. Goldacker (KIT), M. Dhalle (U. Twente), T. Salmi (U. Tampere), J. Himbele, (CNRS Grenoble), L. Rossi, A. Ballarino, C. Scheuerlein. G. Kirby, J. van Nugteren, (CERN), C. Senatore (U. Geneva)

### A. Usoskin – Tape production

Production of 2 m cable length from tape 283D, required grinding of burr. Cu coating was not optimal, with small defects introduced in handling. The new Cu-coating procedure that reduces dog-boning requires the use of additional chemicals, and results in a porous surface. A series of dummies of punch-and-coat cables will be a good exercise to achieve better results.

At present 90 % of the equipment has been relocated. Electroplating bath should be in operation in October 2015. Production PLD for 12 mm tape will be installed in November 2015, first tapes expected beginning 2016.

### A. Ballarino – Alternative sources of tape

Specifications for alternative tape sources:

- 12 mm wide tapes
- UL > 20 m
- 400 A/mm<sup>2</sup> at 4.2 K and 20 T
- Substrate < 100 μm
- Copper range 20...40 μm

Four orders placed:

- SuperOX – order placed (200 m), specification accepted, material in house at CERN, UL of 20 m, 60 μm substrate 2 x 20 μm copper coating;
- Sunam – order placed (100 m), reduced specification (200 A/mm<sup>2</sup> at 4.2 K and 20 T) material in house, UL of 20 m and longer, 60 μm substrate 2 x 20 μm copper
- Fujikura – order placed (200 m), specification accepted, delivery before end of December 2015
- Superpower – order placed (200 m), specification accepted, high Zr material, delivery before end of December 2015.

### A. Kario – Cable production status

2 m sample out of tape 283D produced and ready for delivery for a I<sub>c</sub> test in FRESCA. Delivery at EUCAS. Additional length for transverse compression test can be prepared from tape 284D

Discussion on the experimental plan for the transverse stress experiment. The present baseline is test first a SP cable, with KIT impregnation (Araldite and

Quartz filler), followed by a SP cable with EuCARD2 impregnation (presently glass-fiber sock, CTD101K, no filler), and finally the Bruker cable with EuCARD2 impregnation. KIT has SuperPower tape available for these samples, geometry to be finalized. Bruker tape 284D will be used for the third sample.

Dummy production, the next lengths (40 m for Feather-2 and 2 x 20 m for cos-theta) should follow the “real” procedure, and can be used to validate the process, i.e. using the Bruker machines being set-up. Bruker to send SS tape (question after the meeting, Ag coated to simulate process ?) Delivery is planned by end of October 2015.

Feather-0 production, the next two lengths will be done with the SuperOX and Sunam tapes in house at CERN. For SuperOX a punch-and-coat procedure is again a better idea (fears of delamination). This will be done in the future, the present purchase is already Cu-coated.

### **Discussion on cable geometry**

There is a general consensus to reduce the number of tapes in case of Bruker tape to achieve a cable of constant thickness. At any rate the Bruker tape is outperforming other materials, so that the cable  $I_c$  will be approximately the same. Approximate new geometry is about 1 mm thickness, to be worked out. Updated geometry and properties will be provided at EUCAS.

### **Highlights for EUCAS**

Draft of WP10.2 invited overview is circulated among contributors. The list of contributions related/supported by EuCARD2 and presented at EUCAS is the following:

1A-WT-P-05.05: *On Roebel Cable Geometry for Accelerator Magnet*

2M-LS-O2.6: *Measured and modelled AC magnetization loss of the REBCO Roebel baseline cable for the EUCARD2 accelerator insert magnet*

2M-WT-O1.4: *AC Losses of LTS and HTS Composite Conductors at Low temperatures between 3K and 80K*

2A-WT-P-03.05: *Transverse loading experiments on REBCO Roebel cables with and without impregnation*

3M-WT-O1.1: *Advances in the Development of a 10-kA Class REBCO cable for the EuCARD2 Demonstrator Magnet*

3A-WT-P-02.03: *12mm wide HTS coated conductors for high-field applications*

3M-M-O2.1: *Simultaneous measurement of critical current, stress, strain and lattice distortions in different high temperature superconductors*

3A-WT-P-01.01: *Influence of the oxygen partial pressure on the phase evolution during the melt processing of Bi-2212 superconducting wires*

3A-WT-O1.01: *Field and temperature scaling of the critical current density in commercial REBCO coated conductors*

First data from AC loss measurements (will be available for EUCAS) were presented by Y. Yang and J. van Nugteren for Twente University. The

magnetization of the cable is relatively large, as expected, and the tapes behave such that the magnetic moment of the cable is in essence close to the sum of the magnetic moments of the single tape. Simulations are in progress to verify whether the match to the data is good, by which mean we can validate the prediction of field quality.

## **AOB**

T. Salmi recalls that actions are required to initiate the quench experiments agreed (tape material, experiment set-up, test, etc.). To be discussed at EUCAS and/or WAM-HTS.

Next meetings at EUCAS and/or WAM-HTS to follow-up on the various actions.