First fully European CORC® cables

M. Vojenčiak, J. Šouc, M. Soloviov, F. Gömöry, M. Falter, M. Baecker, M. Bauer, V. Große
Introduction

Fondue
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Fondue

Can you use other kinds of cheese for delicious fondue?

Gruyère cheese + White wine + Fondue pot
First fully European CORC® cables

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European REBCO coated conductors

Coated conductors producers
European REBCO coated conductors

Deutsche Nanoschicht
- Different architecture
- Different technology
- Different properties

THEVA
- 20 µm copper (surround)
- CSD deposition technology
- 60 µm Ni5W substrate
- 100 µm copper
- PVD deposition technology
- 100 µm hastelloy
Off-axis bending test

6.35 mm former diameter acceptable for both tapes
Tensile force during winding

< 10 N tensile force need for Deutsche Nanoschicht tape

20 N tensile force acceptable for THEVA tape
DeutscheNanoschicht cable
Deutsche Nanoschicht cable

- former diameter 6.35 mm
- 8 tapes
- two layers
- lay angle 32 degrees
Critical current measurement

Critical current estimated from voltage on terminals

\( I_c = 730.2 \, \text{A} \)
Individual tapes

Straight tapes \(\sum I_c = 828\ A\)

Wound tapes \(\sum I_c = 853.5\ A\)

Tapes in cable \(\sum I_c = 789.9\ A\)

Terminals are essential for cable performance
Forced flow cooling

Current leads

Tape is not in contact with copper

Terminals suitable for forced-flow cooling

Thermal insulation (non-vacuum)

Rigid polyurethane foam

Aerogel (cryogel)
Forced flow cooling – liquid nitrogen flow inside former

Polyurethane foam – 14 % critical current reduction
Cryogel – 9.5 % critical current reduction
Temperature increase ~ 1 – 2 K
CORC cable can be tested (used) in forced flow conditions using non-vacuum insulation
THEVA cable
THEVA cable

- former diameter 6.35 mm
- 4 tapes
- single layer
- lay angle 41 degrees
Critical current measurement

Strongly inhomogeneous current distribution – problem with terminals, not tapes themselves
Individual tapes

Straight tapes: $\sum I_c = 344.8$ A

Wound tapes: $\sum I_c = 320.2$ A

Tapes in cable: $\sum I_c = 320.25$ A

Only small degradation caused by cabling process
Cable bending

Cable is flexible, it can be bent down to diameters ~ 10 cm without degradation
Conclusions - I

CORC cable is very flexible – allow bending down to 5 cm diameter (even when tape experience high stress during cabling)

Forced flow cooling is applicable for CORC cable testing
Conclusions - II

There are many kinds of swiss cheese suitable for fondue

but not all of them !!!!

I can’t say conclusion about all \textit{REBCO} tapes,

but

\textbf{THEVA}

\textbf{deutsche nanoschicht}

are suitable for CORC cables