



Poster title goes here, containing strictly only the essential number of words...



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Introduction

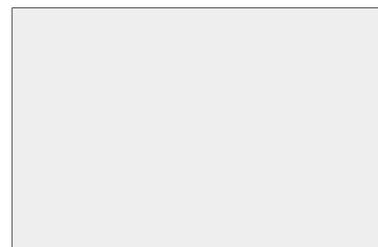
First...
Check with conference organisers on their specifications of size and orientation, before you start your poster eg. maximum poster size; landscape, portrait or square.
The page size of this poster template is A0 (84x119cm), landscape (horizontal) format. Do not change this page size, MIU can scale-to-fit a smaller or larger size, when printing. If you need a different shape start with either a portrait (vertical) or a square poster template.
Bear in mind you do not need to fill up the whole space allocated by some conference organisers (eg. 8ftx4ft in the USA). Do not make your poster bigger than necessary just to fill that given size.

Aim

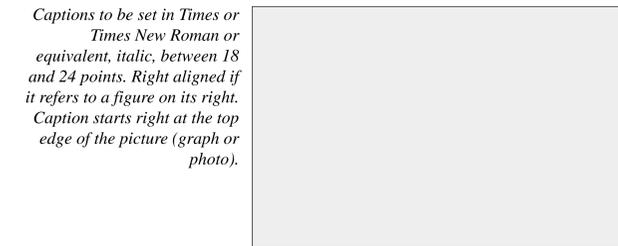
How to use this poster template...
Simply highlight this text and replace it by typing in your own text, or copy and paste your text from a MS Word document or a PowerPoint slide presentation.
The sub-title text boxes can be moved up or down depending on how big or small your 'Introduction', 'Aim', 'Method', 'Results' and 'Conclusion' are.
The body text / font size should be between 24 and 32 points. Arial, Helvetica or equivalent.
Keep body text left-aligned, do **not** justify text.
The colour of the text, title and poster background can be changed to the colour of your choice.

Method

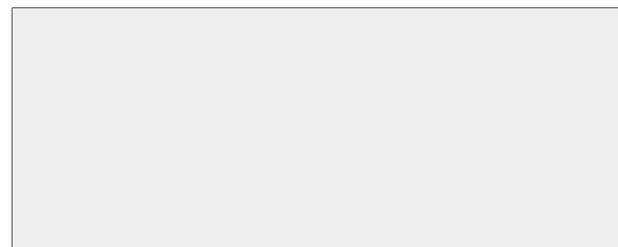
Tips for making a successful poster...
▪ Re-write your paper into poster format ie. Simplify everything, avoid data overkill.
▪ Headings of more than 6 words should be in upper and lower case, not all capitals.
▪ Never do whole sentences in capitals or underline to stress your point, use **bold** characters instead.
▪ When laying out your poster leave breathing space around you text. Don't overcrowd your poster.
▪ Try using photographs or coloured graphs. Avoid long numerical tables.
▪ Spell check and get someone else to proof-read.



Captions to be set in Times or Times New Roman or equivalent, italic, between 18 and 24 points. Left aligned if it refers to a figure on its left. Caption starts right at the top edge of the picture (graph or photo).



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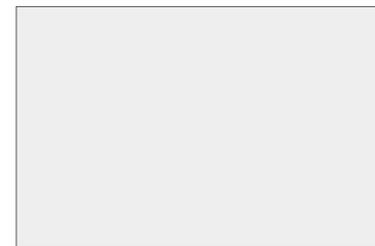


Captions to be set in Times or Times New Roman or equivalent, italic, 18 to 24 points, to the length of the column in case a figure takes more than 2/3 of column width.

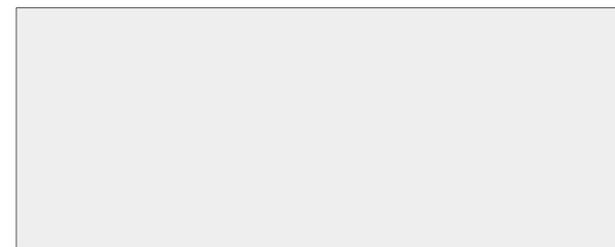
Results

Importing / inserting files...
Images such as photographs, graphs, diagrams, logos, etc, can be added to the poster.
To insert scanned images into your poster, go through the menus as follows: Insert / Picture / From File... then find the file on your computer, select it, and press OK.
The best type of image files to insert are JPEG or TIFF, JPEG is the preferred format.
Be aware of the image size you are importing. The average colour photo (13 x 18cm at 180dpi) would be about 3Mb (1Mb for B/W greyscale). Call MIU if unsure.
Do **not** use images from the web.

Notes about graphs...
For simple graphs use MS Excel, or do the graph directly in PowerPoint.
Graphs done in a scientific graphing programs (eg. Sigma Plot, Prism, SPSS, Statistica) should be saved as JPEG or TIFF if possible. For more information see MIU.



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Printing and Laminating...
Once you have completed your poster, bring it down to MIU for printing. We will produce a A3 size draft print for you to check and proof read. The final poster will then be printed and laminated.
Note: Do not leave your poster until the last minute. Allow at least 5 working days before you need to use it.
Simply highlight this text and replace.

Cost...
For poster-printing and laminating charges contact MIU.

Conclusion

For more information on:
Poster Design, Scanning and Digital Photography, and Image / file size.

Contact:
Medical Illustration Unit
Prince of Wales Hospital
Ph: 9382 2800
Email: miunsw@unsw.edu.au
Web: <http://miu.med.unsw.edu.au>

Acknowledgements

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Characteristic Study of an Novel Inherent Cooling High Temperature Superconducting Composite Conductor with REBCO for Energy Storage Applications

Thu-Af-Po4.08-17[137]

Poster Session 4.08 13:45 - 15:30

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Introduction

A novel high temperature superconducting twisted stacked-tape in tube (HTS TSTT) composite conductor is proposed in China Electric Power Research Institute (CEPRI). It is combined by REBCO tapes and metal jacket and it has inherent helical cooling tunnel and kA class current carrying ability. The characteristics of electro-magnetic and critical current are analyzed by using COMSOL software. A 1.5 m HTS TSTT conductor consisted of 4 REBCO tapes before and after bending are tested for their critical current sharing performance. It can be proved to have an excellent performance for winding the coil of MJ class SMES magnet.

HTS TSTT Profile

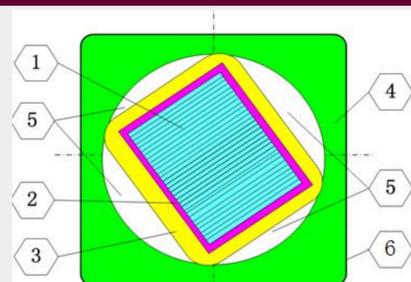


Fig. 1. The schematic diagram of HTS TSTT structure

It mainly includes (1) superconducting core which has multi-ply REBCO superconducting tapes stacked in parallel, the ID number of the tape is 1,2,...,n from the top to bottom (n is the total number of tapes); (2) soft metal coating layer using silver-plated copper wire; (3) inner aluminum coating layer; (4) outer aluminum jacket; (5) cold media channel; (6) insulation coating layer.

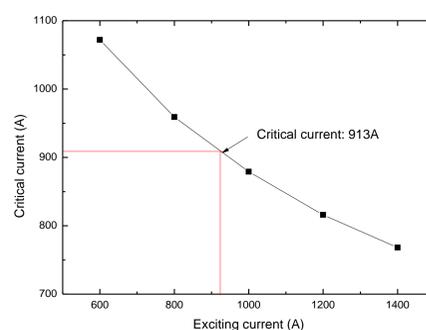
Table I Specification of the HTS TSTT conductor

Parameters	Value
Sectional dimension	13mm×13mm
Length	100m
Inner diameter	10.8mm
Pitch	>200mm
Superconducting core size	9.6mm×4.8mm
Thickness of soft metal coating layer	0.5mm
Critical tensile stress (77 K)	250 MP
Critical tensile strain (77 K)	0.3%
Minimum double bending diameter	300mm
REBCO tape number	4

It is important to note that the middle REBCO stacked conductors are arranged in parallel with a certain twist pitch and the cold media can be liquid or gas.

Critical Current Analysis

Fig. 2. The relationship between the critical current and exciting current of HTS composite superconductor



Ic model

$$I_c(B, \theta) = \frac{I_{\perp}(B)}{\sin^2 \theta + \frac{I_{\perp}(B)}{I_{\parallel}(B)} \cos^2 \theta}$$

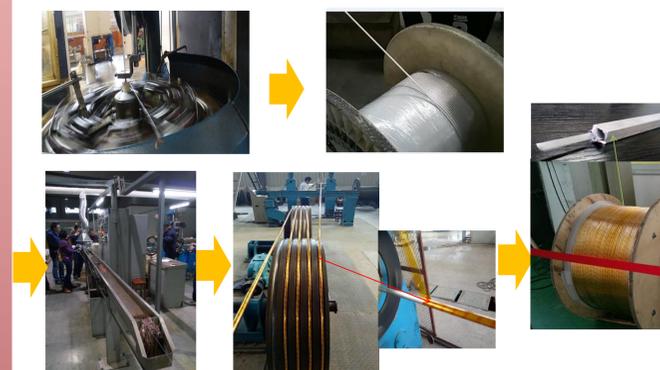
$$I_{\parallel}(B) = 0.2113 \times e^{-|B_x|/0.0860} + 0.5604 \times e^{-|B_x|/0.7664} + 0.2408$$

$$I_{\perp}(B) = 1.0496 \times e^{-|B_y|/2.1593} + 0.5604 \times e^{-|B_y|/0.1374} - 0.4732$$

$$\theta = \arctan(B_y / B_x)$$

Experiment and Results

➤ Continuous Conductor Manufacturing
CEPRI has carried out the process design and a single HTS TSTT composite conductor with 100 meters is manufactured in China.



➤ The Critical Current Testing System

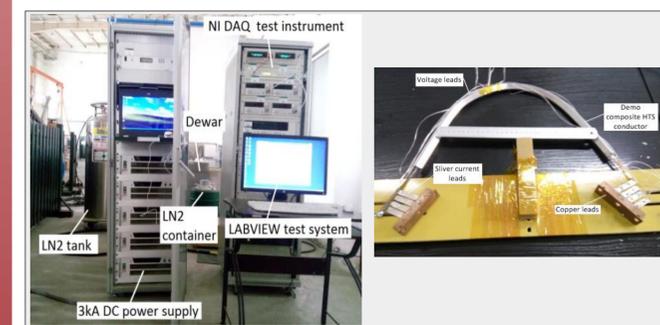


Fig. 3. V-I test system photo for composite HTS conductor.

The test system consists of a NI Data Acquisition (DAQ) test instrument, a 3 kA DC power supply with quench protection circuit and a cryogenic dewar. A 1.5m HTS TSTT composite conductor is placed in a vessel which is filled with LN2 at 77 K.

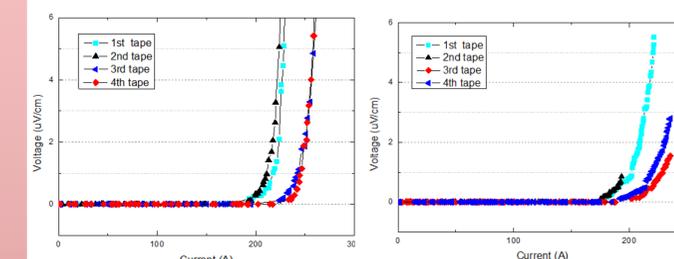


Fig. 4. Experimental V-I curve of each REBCO tape of composite superconducting conductor without and with 160mm bending radius.

Table II The critical current comparison between calculation and experimental results

Item	Theoretical value	Experimental Ic value of composite HTS conductor	
		Straight	Bending
Critical current/A@77K	913	780	700
Reduction ratio	-	14.5%	23.3%

Conclusion

A T-A equation model is applied to calculate the theoretical critical current of the TSTT conductor. A single TSTT cable with 100 meters is manufactured by CEPRI. The critical current experimental system is built for the composite conductor. Compared to the theoretical value with 913 A@77 K, the critical current reduction ratio of straight and bending TSTT conductor are 14.5% and 23.3%. As a result, the HTS TSTT composite superconductor can be considered as the recommended superconducting material for a MJ class SMES magnet.