

# History of REBCO CCT Tape Stack at LBNL (back to 2017)

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## Strain Distribution in REBCO-Coated Conductors Bent With the Constant-Perimeter Geometry

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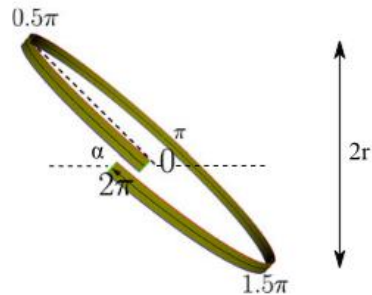
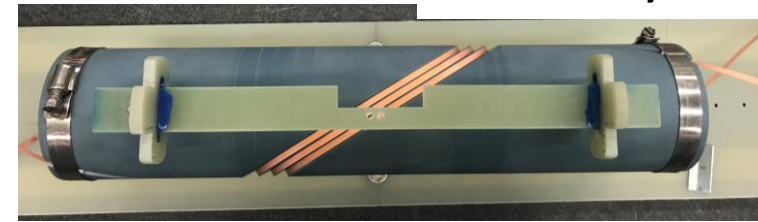


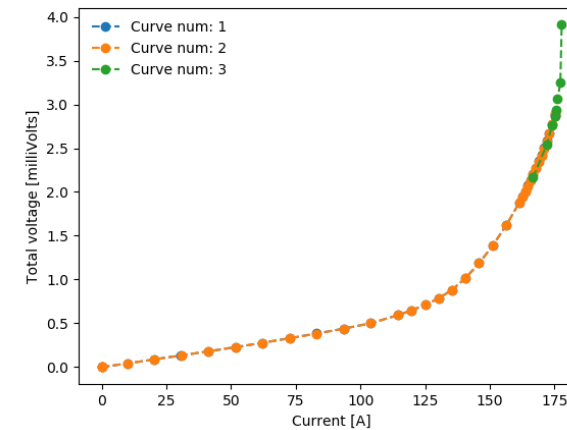
Fig. 5. Tape forms a CCT dipole winding. It is generated from the base curve given by (11). The peak axial strain occurs at the poles at  $t = 0.5\pi$  and  $1.5\pi$ . The attached pdf file gives the 3-D interactive version of the figure that can be viewed with Acrobat Reader.

## Reed Teyber (2019)



3 turn CCT, 77 K Ic meas comparing

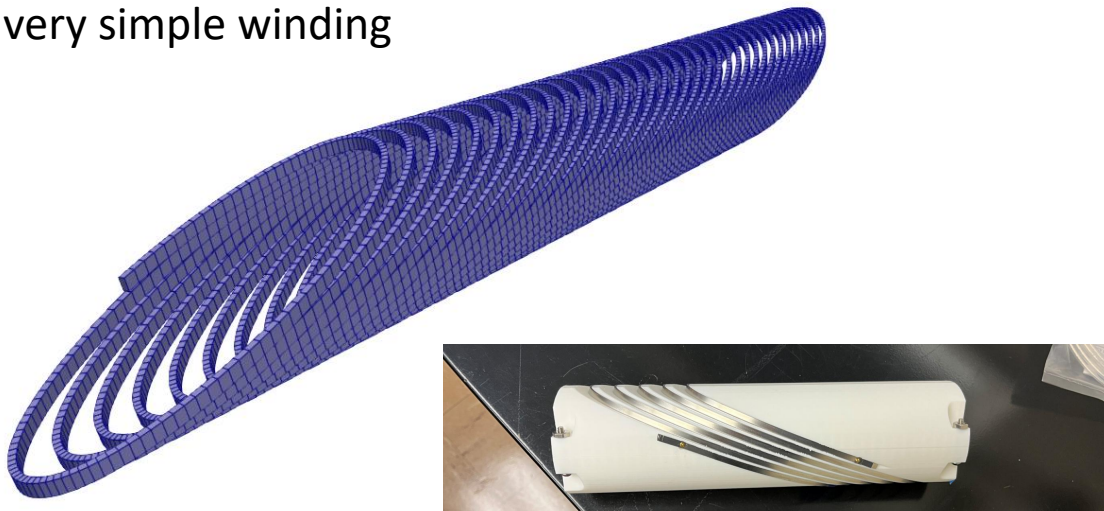
- single tape
- 3 tape stack (dry)



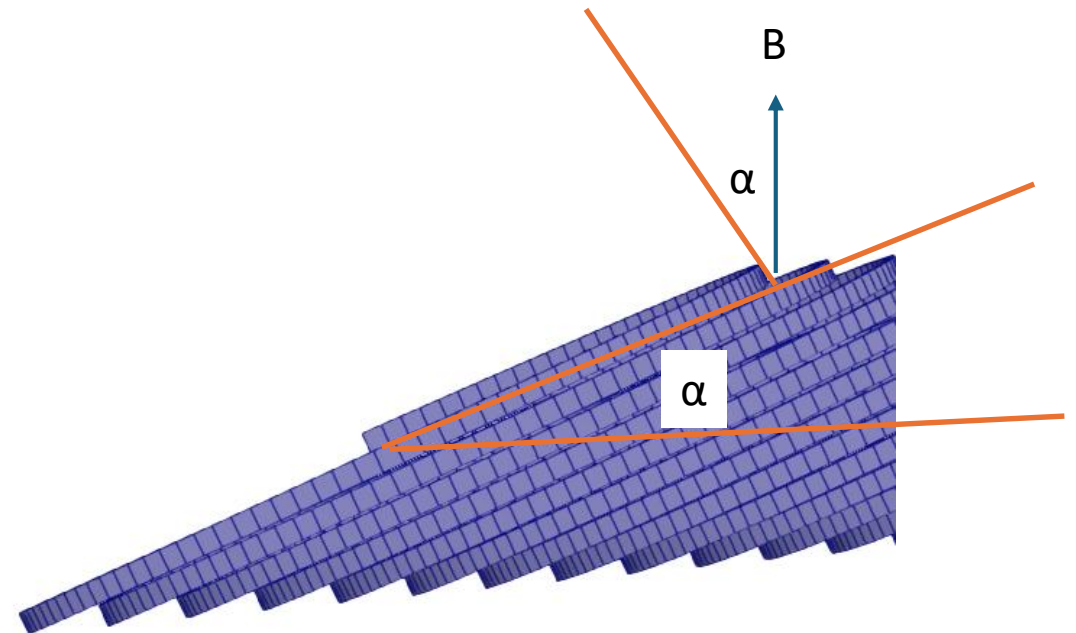
# Geodesic CCT dipole windings

Unique rectifying developable calculated from the central path for  
~zero hardway bending

Dipole (like stacked planer coils) is a  
very simple winding



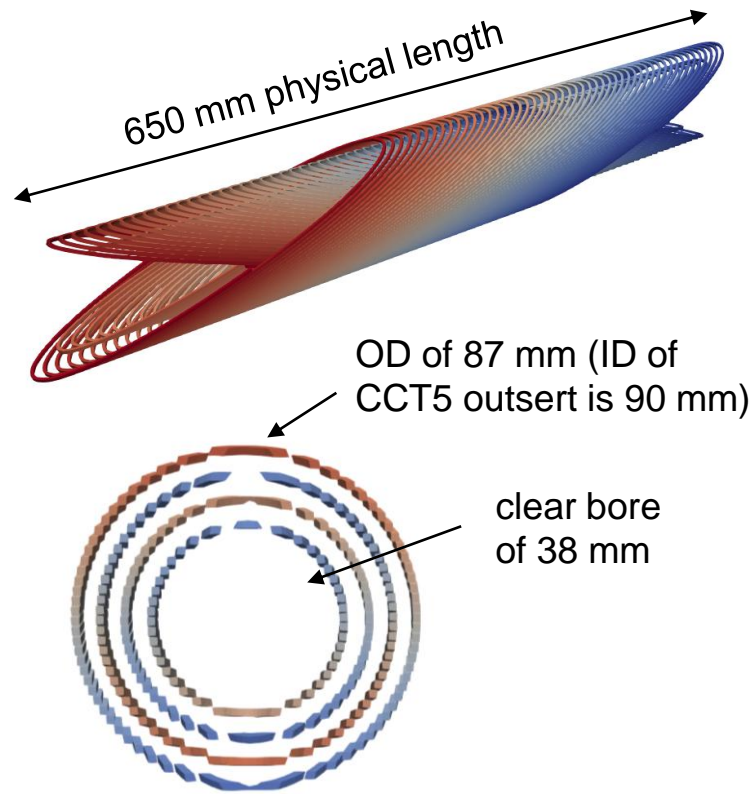
The alignment of the tape with  
the field is connected to tilt angle  
(ignoring ends ect.)



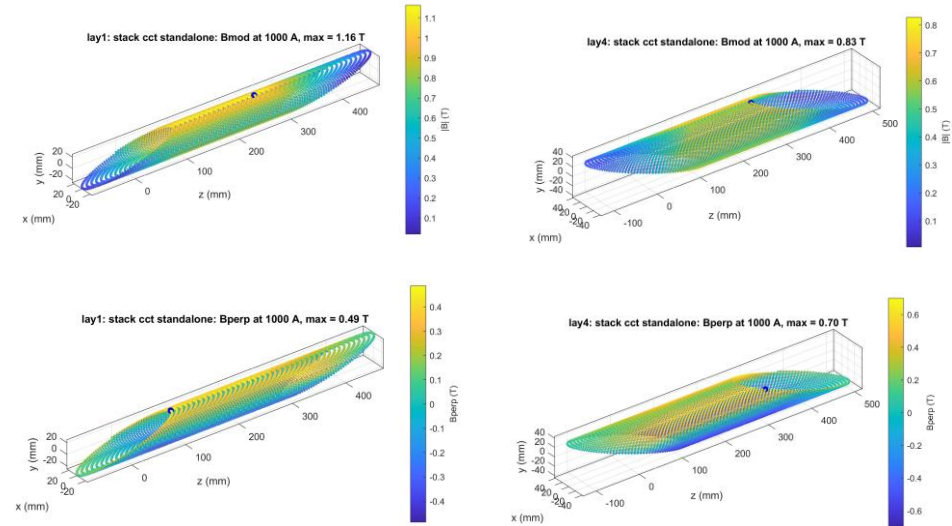
As the coil becomes more magnetically efficient ( $\alpha \rightarrow 0$ ) we also expect less perpendicular field component

# Motivation: initial scoping (on paper) shows promise for a four-layer 10 T standalone design that also fits inside CCT5 for hybrid testing

Four-layer CCT design with 2 mm REBCO tape



Assuming a stack of 20 HM tapes



- without iron and without end optimization in the (now limiting) outer layers we get an  $I_c$  of  $\sim 7.5$  T dipole field at 7.5 kA

Of course, there many important design and experimental details that would need to be addressed by an R&D program

# Next Steps and Initial Thoughts on Milestones

A group of us are just beginning to look at the challenges and program plan to get to a high-field tapestack design

1. Initial technology development program (winding, joints, impregnation, etc.)
2. First 4.2 K test of high-current, stack-CCT layer in dipole configuration (M1)
3. Test of a stand-alone magnet at 4.2 K (M2)

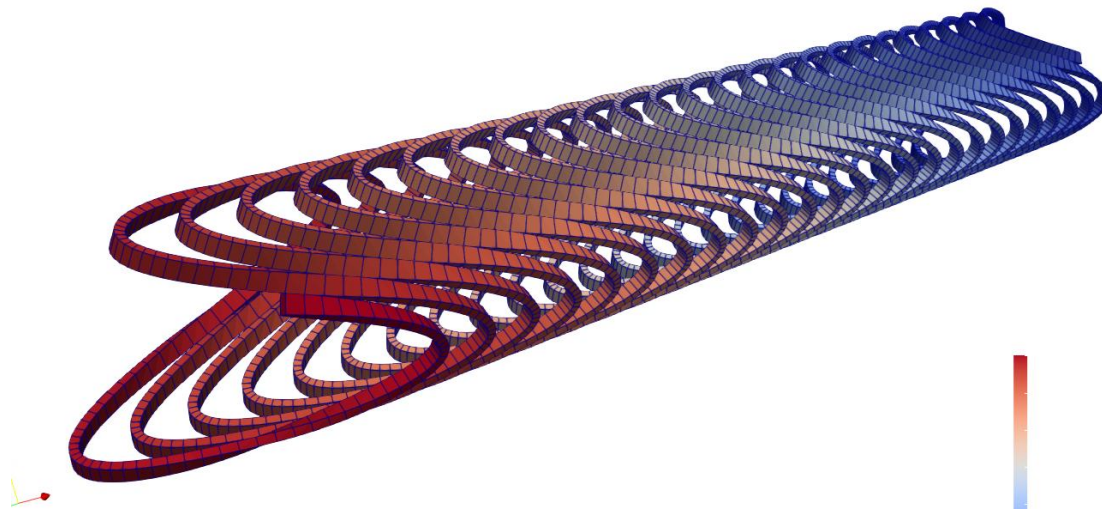
Strong mix of design and experimental effort

# Extra

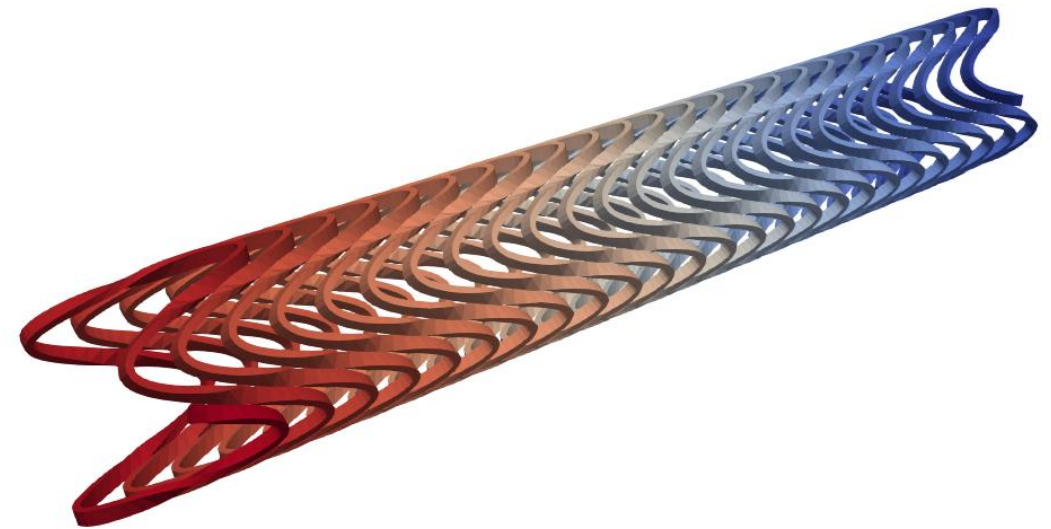
# Geodesic CCT windings extends to higher order and combined function magnets

Dipole is set up for very nice automated winding – tilted pancakes (higher order may be more difficult)

Quadrupole



Sextupole



# Geodesic CCT windings

- 50 mm aperture dipole winding geodesic
- SS strip close to 4 mm width, 10 layers as a quick test

