



U.S. MAGNET  
DEVELOPMENT  
PROGRAM

# C3 update

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MDP general meeting, 2 August 2023

- **C3a – the 3-turn subscale practice magnet for C3**
- **Completed three last layers**
  - Layers 5, 6 and 1b
- **Assembled the coils**
  - Three layers used the C3 prototype wire
- **Aiming for cold test in October to provide feedback on**
  - magnet fabrication techniques
  - **C3 wire performance**

# Evolution of the transport performance for individual layers

Normalized to the  $I_c$  before winding

Layer	Conductor	$R_{min}$ (mm)	Before winding	After winding	After Stycast
1	AP	30	100%	78%	76%
2	AP	35	100%	79%	65%
3	AP	30	100%	82%	80%
4	AP	35	100%	82%	77%
2b	HM	35	100%	73%	72%
5	HM	30	100%	72%	71%
6	AP	35	100%, used Layer 4	81%	79%
1b	HM	30	100%, used Layer 5	73%	71%

- AP wires 18% - 22%  $I_c$  reduction after winding; HM wires show a higher reduction 27%
- After painting Stycast, < 3% reduction; **two early outliers**

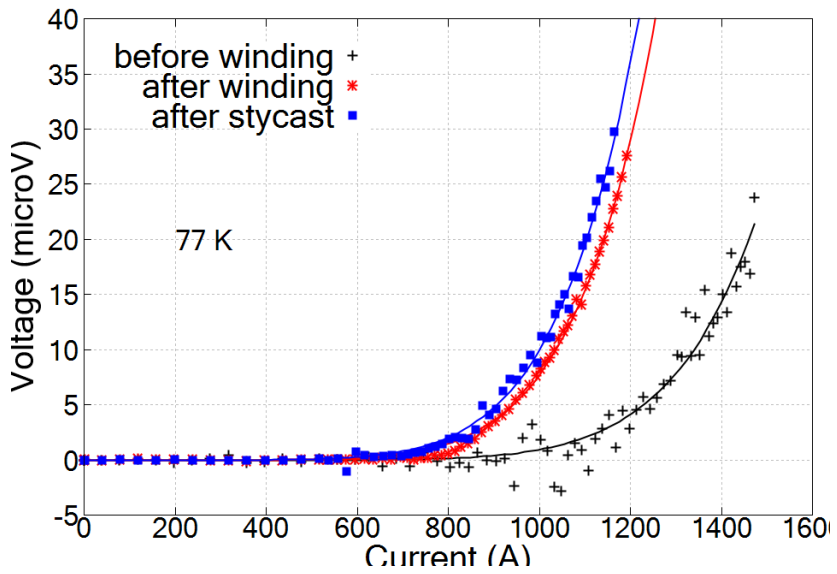
# The 77 K data suggest that HM and AP wires have similar $I_c$ retention after winding

Normalized to the  $I_c$  before winding

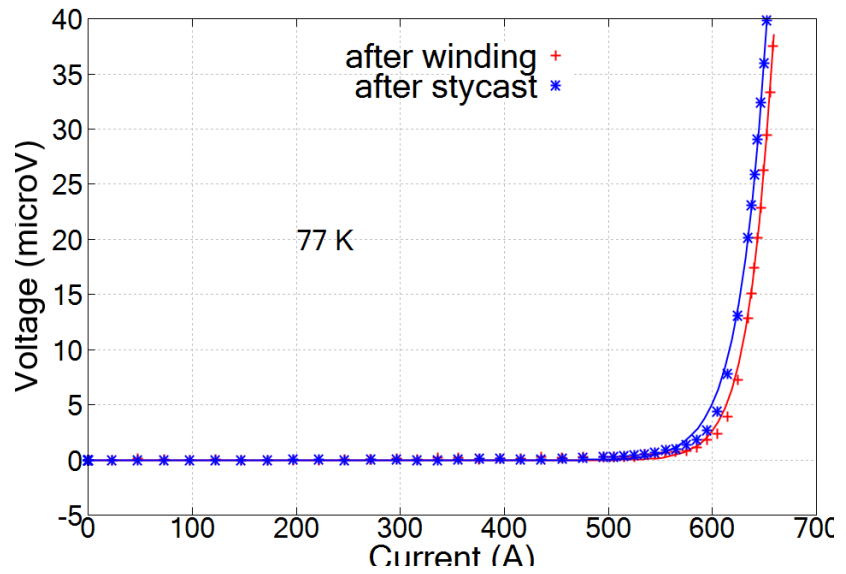
Layer	Conductor	$R_{\min}$ (mm)	Expected from self-field	Measured	Difference
1	AP	30	86%	78%	-8%
2	AP	35	86%	79%	-7%
3	AP	30	87%	82%	-5%
4	AP	35	91%	82%	-9%
2b	HM	35	78%	73%	-5%
5	HM	30	81%	72%	-9%
6	AP	35	92%	81%	-11%
1b	HM	30	80%	73%	-7%

# Compared to AP wires, HM wires consistently show higher $n$ values after winding, indicating a more uniform $I_c$ among tapes

Layer 1 AP wire.  $n$  value: 7 – 8

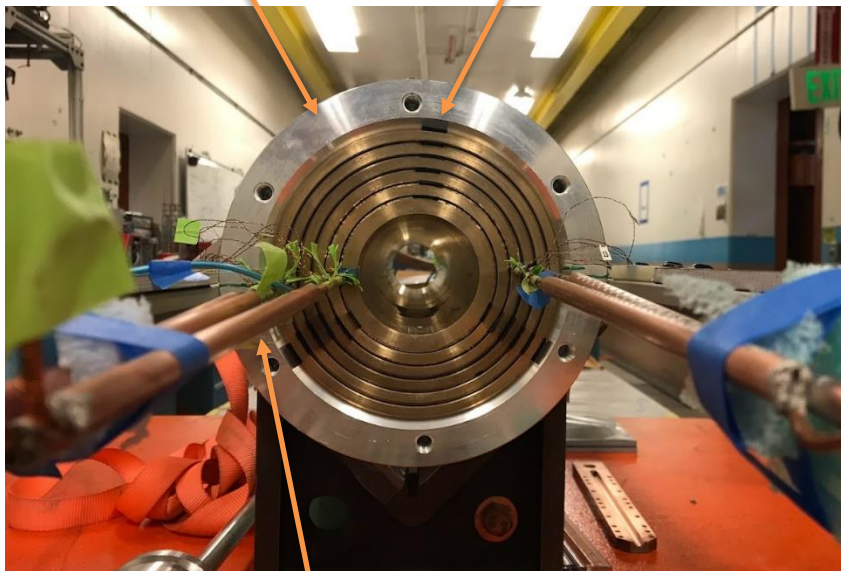


Layer 1b HM wire.  $n$  value: 24 – 27



# Assembled all the layers of c3a, the 3-turn version

Al shell    Kapton shims



Current leads to be joined

Next few months:

- Fill the radial gaps with Stycast
- Install the end plates
- Join the current leads
- Prepare instrumentations
- Test at 77 and 4.2 K

# Status of C3, the 40-turn version



Layer 4 completed

- Mandrels: four done, two to go
- ACT expects to deliver the first C3 wire in September

# Questions from the audience

- **Soren**
  - Does  $n$  value depend on temperature?
  - What's the plan for the CPRD order of the C3 prototype wire?
- **George**
  - Why  $I_c$  degraded after stycast? Do we understand it?