Summer Accelerator Updates

Week of 6/4-6/11

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Last Week's Goals

- Meet with Xingchen Xu and Vadim Kashikhin
- Understand which projects I could join on REBCO HTS R&D
  - *(REBCO = rare earth barium copper oxide; HTS = high temperature superconductor)*
- Perform literature review to understand the status of REBCO studies
- Do background reading on superconductivity
- Review Katsuya's previous accelerator lectures and work through derivations

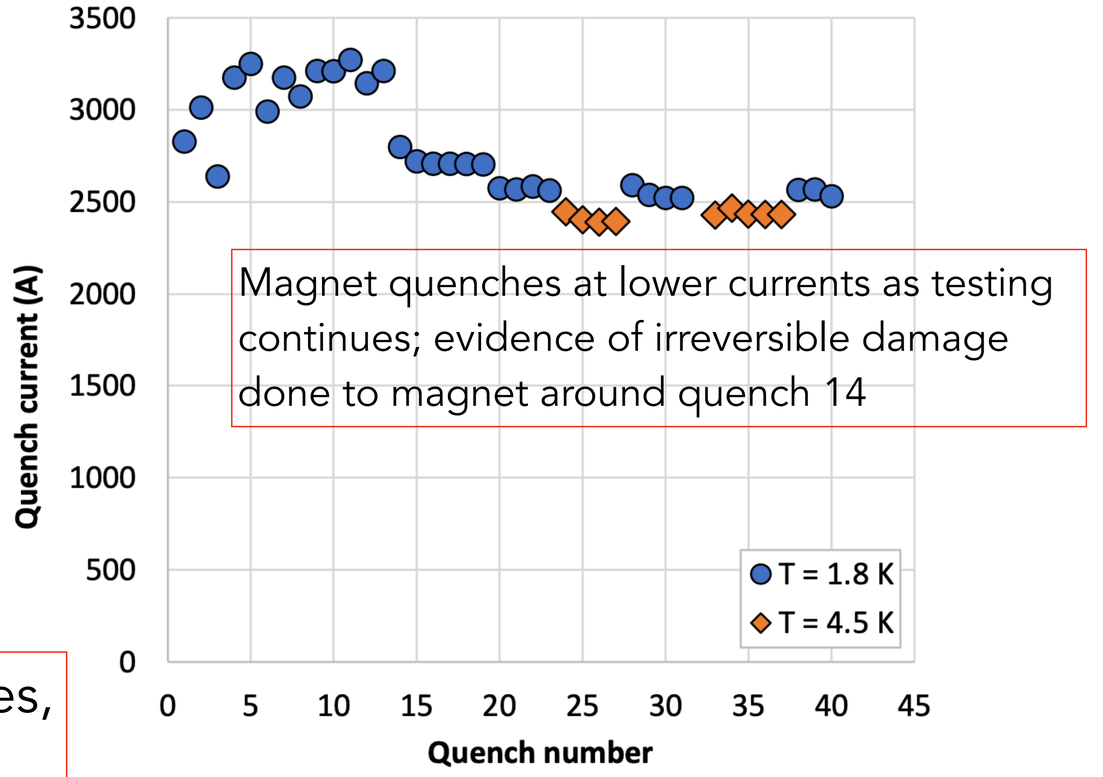
Progress

- Worked through Katsuya's lectures and some lectures on superconductivity
- Read several papers on REBCOs, including Vadim's most recent work
  - For a full list of papers **and** lectures with links, see https://github.com/rosepowers29/SummerAcceleratorWork/issues/1
- Spoke with Xingchen and Vadim and learned about two projects:
  - Stress testing round REBCO wire to understand how its critical current will degrade under Lorentz forces (Xingchen) — I could perform some FEA/CAD modeling and simulation
  - Determining optimal parameters for critical current retention in flat REBCO Rutherford cables (Vadim) — I have been in touch with a student on this project (Emily Romancew) who has already made significant progress on modeling with FEA, I could join her efforts and also help with hardware testing once we get the REBCO tapes
  - Emily will send me files/documentation relevant to her work when she gets a chance

Representative table and plot for I_C *degradation after quench testing*

COIL CRITICAL CURRENTS AND N-VALUES

Condition	Temp (K)	Half-coil 1		Half-coil 2	
		I_c (A)	n	I_c (A)	n
Before LHe test		443	6.4	422	7.5
After LHe test	77	304	5.5	253	4.8
I_c retention		0.69		0.60	
First *V-I* measurement		2366	7.3	1343	4.0
Last *V-I* measurement	1.8	2245	7.3	1112	3.8
I_c retention		0.95		0.83	
Lift factor along load line		7.4		4.4	



Magnet quenches at lower currents as testing continues; evidence of irreversible damage done to magnet around quench 14

For the current study on flat Rutherford cables, the goal is ≤ 90% I_C retention

Table II and Fig. 4 From [1] on COMB STAR REBCO magnet coils (Conductor On Molded Barrel Symmetric Tape Round wires)

Issues

- After speaking with Emily, I aimed to get familiar with the FEA software she uses (ANSYS)
- Unfortunately, I discovered that ANSYS has no compatible version for Mac OS
  - Is ANSYS available on any of the Linux-based HPC clusters (eg lxplus, CMSLPC, ap23…)?
  - If not, would there be a way to borrow a Linux or Windows machine from FNAL this summer, just so I can run ANSYS?

Goals for Next Week

- Get the ANSYS question resolved
- Look through Emily's files and begin working with the software
  - Try to reproduce some of her work
- Continue to confer with Emily, Vadim, and Xingchen on how best I can contribute to the project
- Get familiar with the REBCO studies underway at LBNL as well
- Continue to look through lectures on superconductivity and read papers