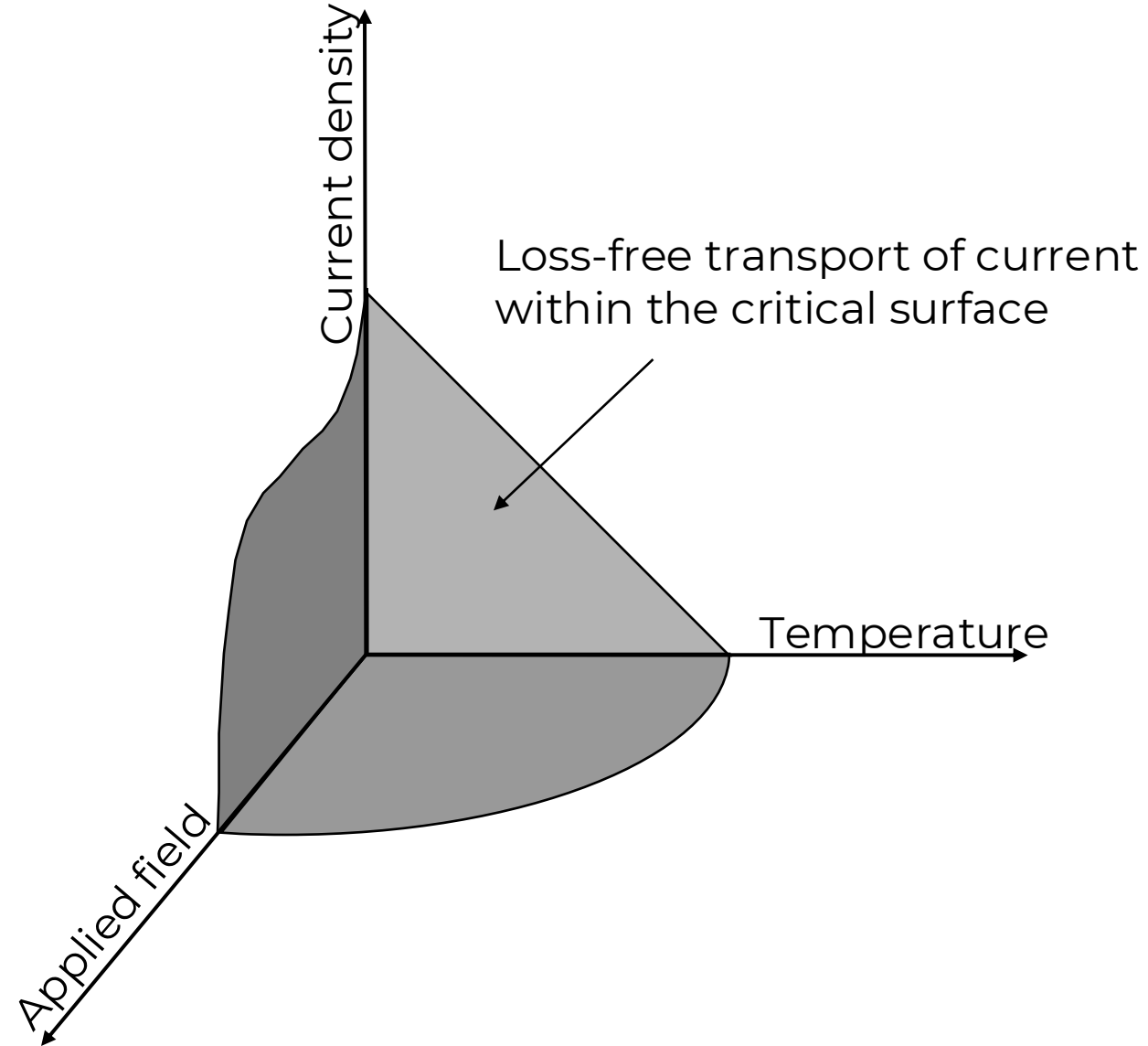


Will a background magnetic field alter REBCO irradiation damage rate?

Z. L. Fisher, A. Devitre,  
D. X. Fischer, Z. S. Hartwig



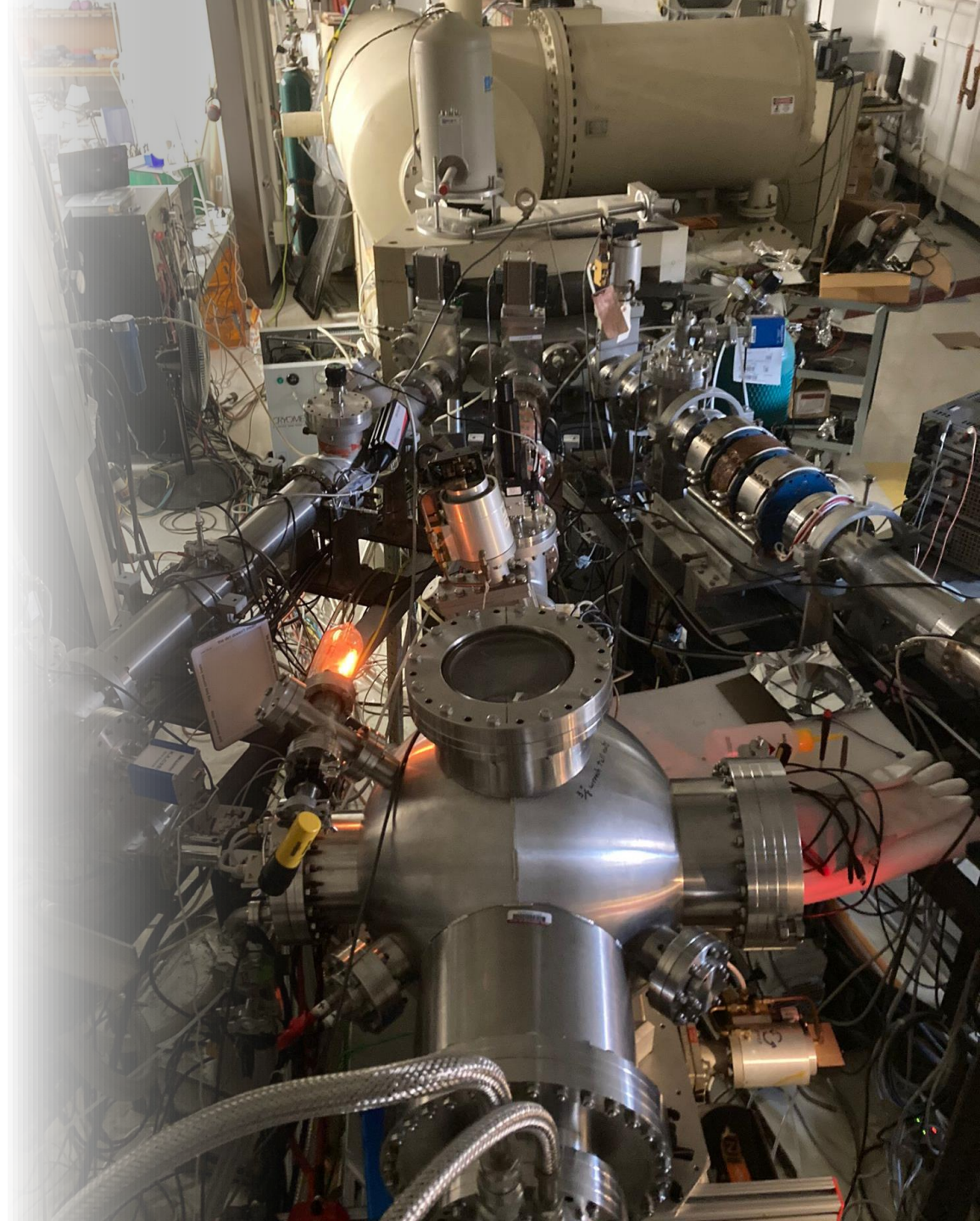
# Performance depends on **critical surface**



# Cryogenic proton irradiation **facility**

1.7 MV Tandetron  
accelerator → 1.2 MeV p<sup>+</sup>

20 K, 10<sup>-6</sup> Torr chamber

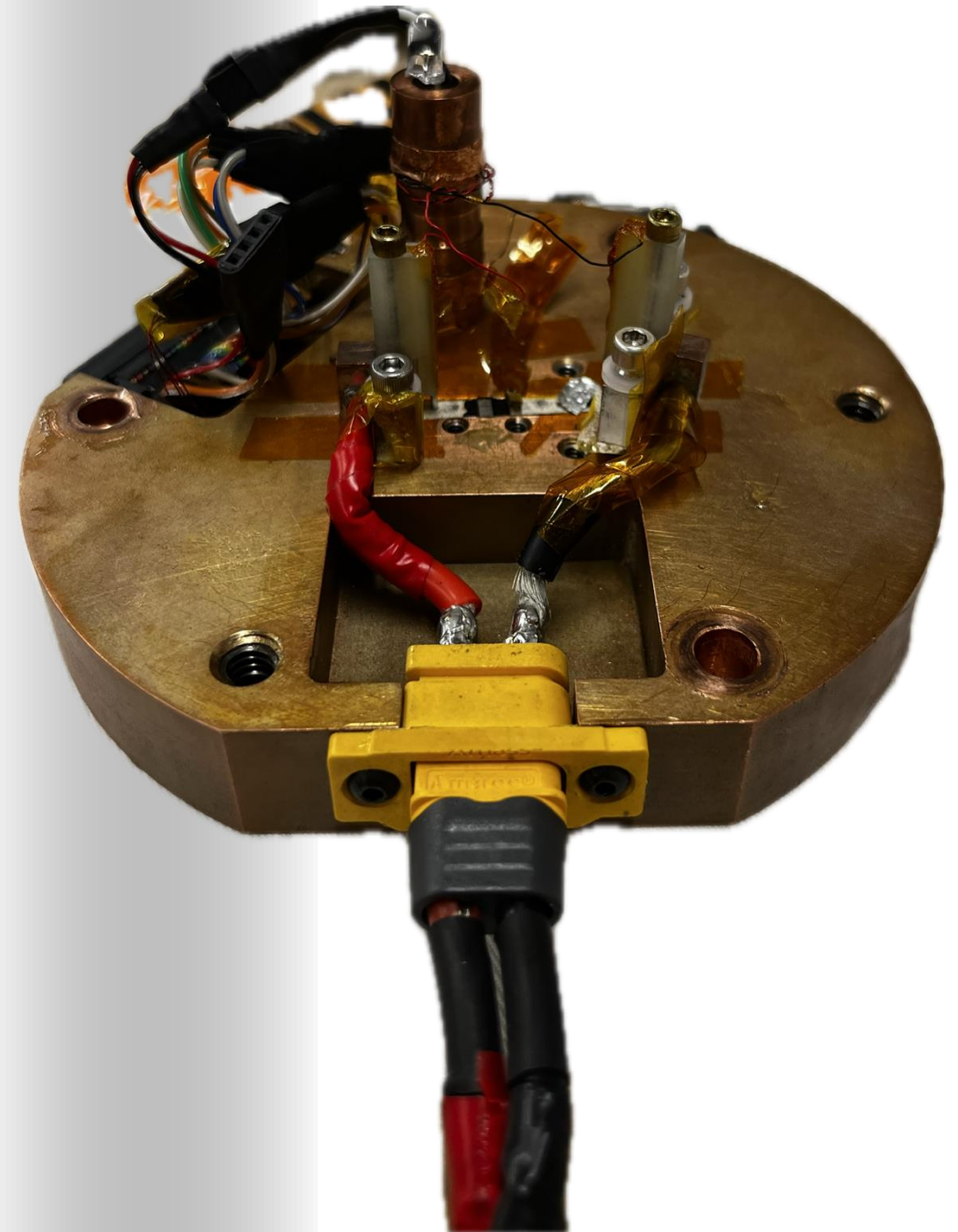


# Cryogenic proton irradiation **facility**

1.7 MV Tandetron  
accelerator → 1.2 MeV p<sup>+</sup>

20 K, 10<sup>-6</sup> Torr chamber

Sample holder with a  
removable 0.33 T  
permanent magnet

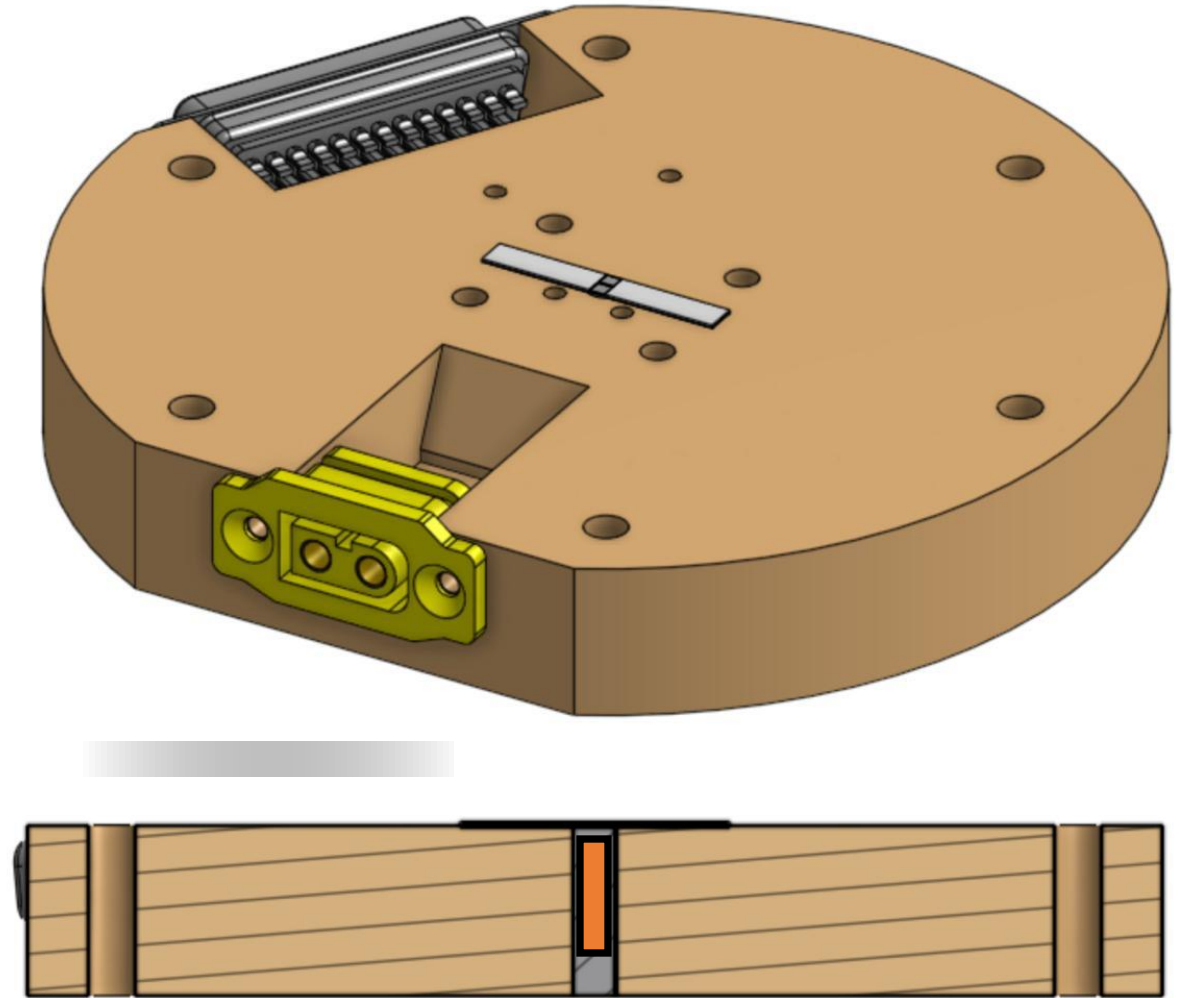


# Cryogenic proton irradiation **facility**

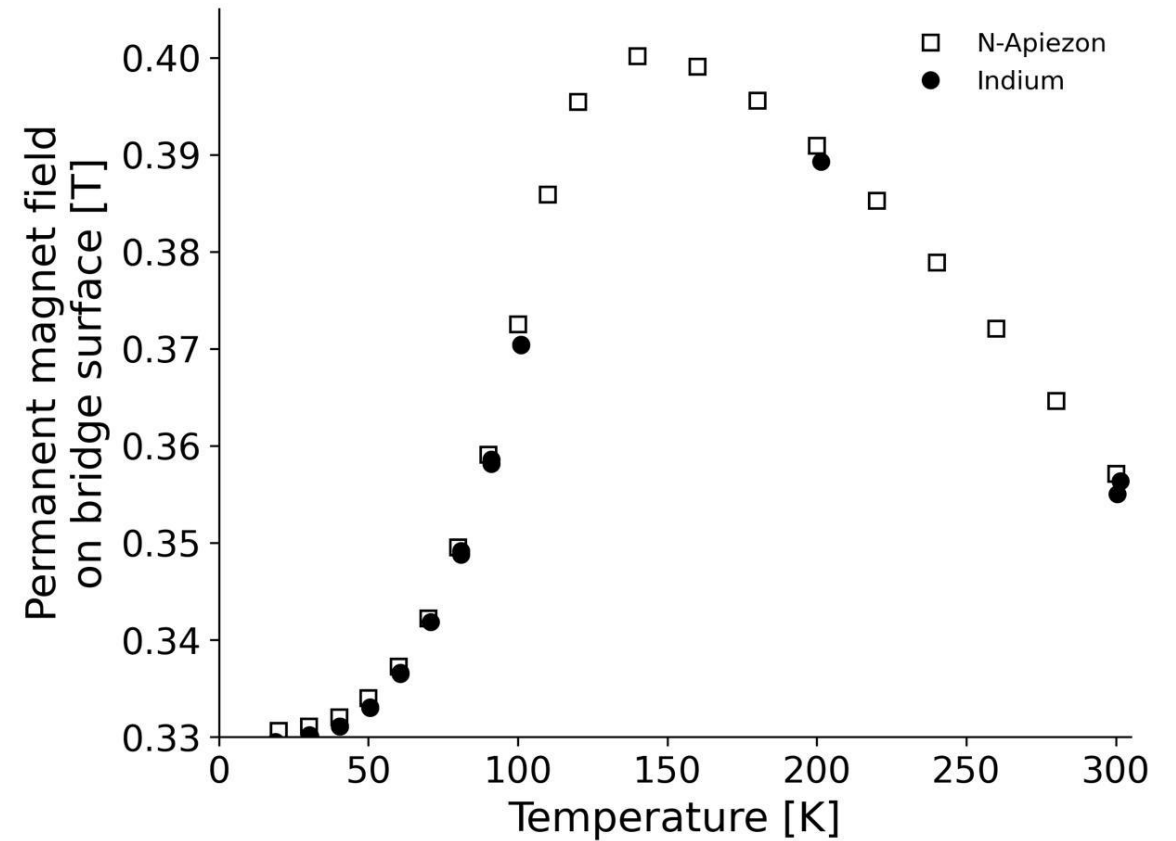
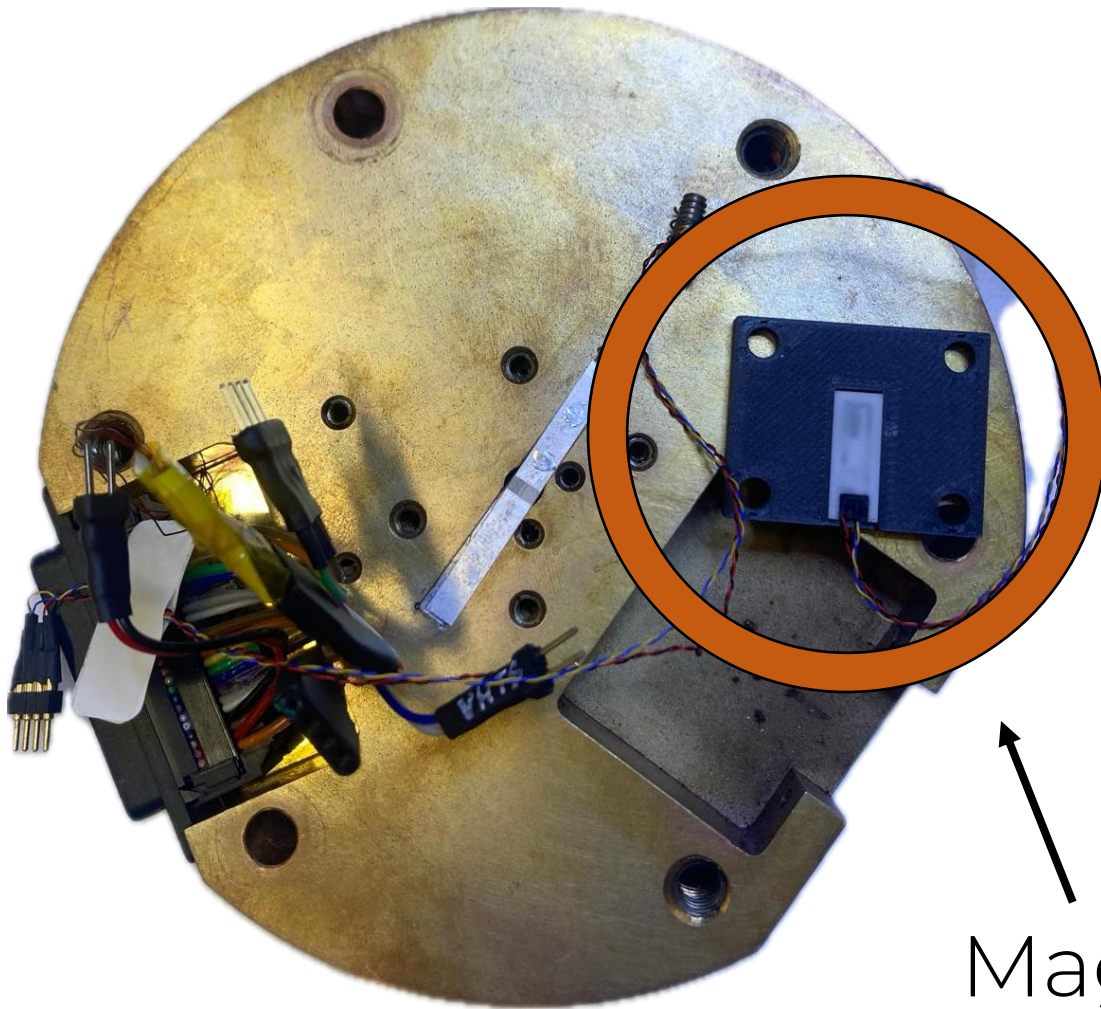
1.7 MV Tandetron  
accelerator → 1.2 MeV p<sup>+</sup>

20 K, 10<sup>-6</sup> Torr chamber

Sample holder with a  
removable 0.33 T  
permanent magnet

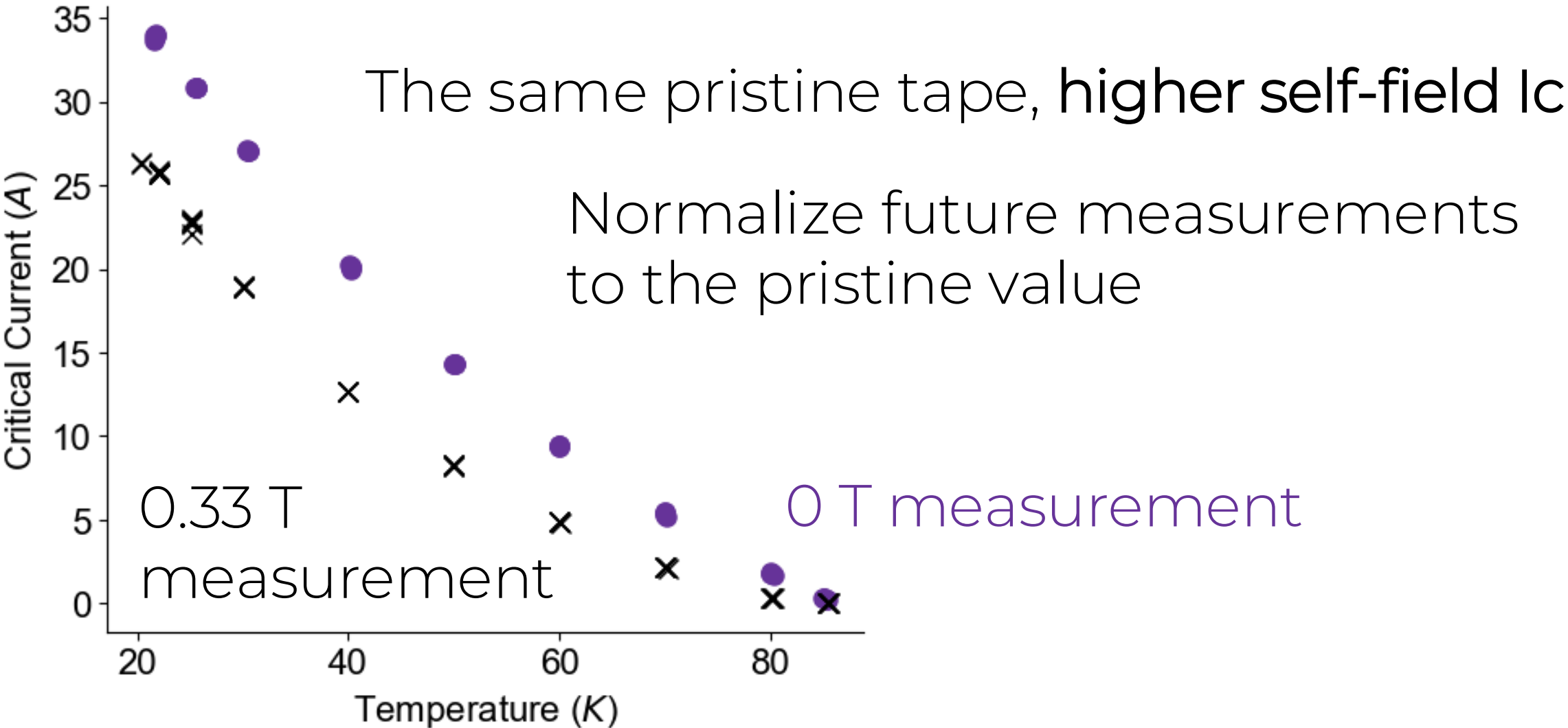


# Measuring the magnetic field at **0.33 T**

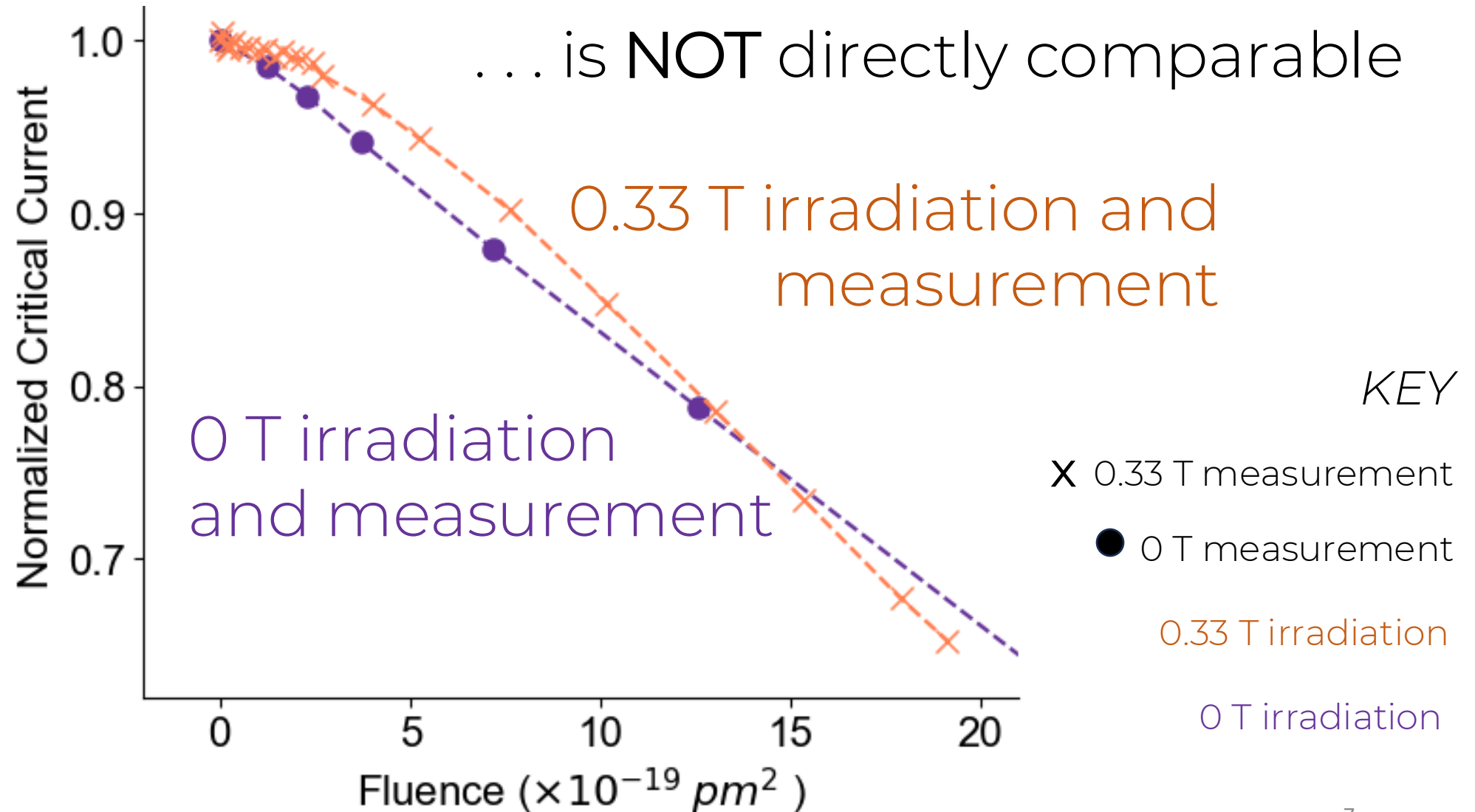


Magnetic field sensor

# Background field **alters critical current**



# $I_C$ measured in irradiation conditions

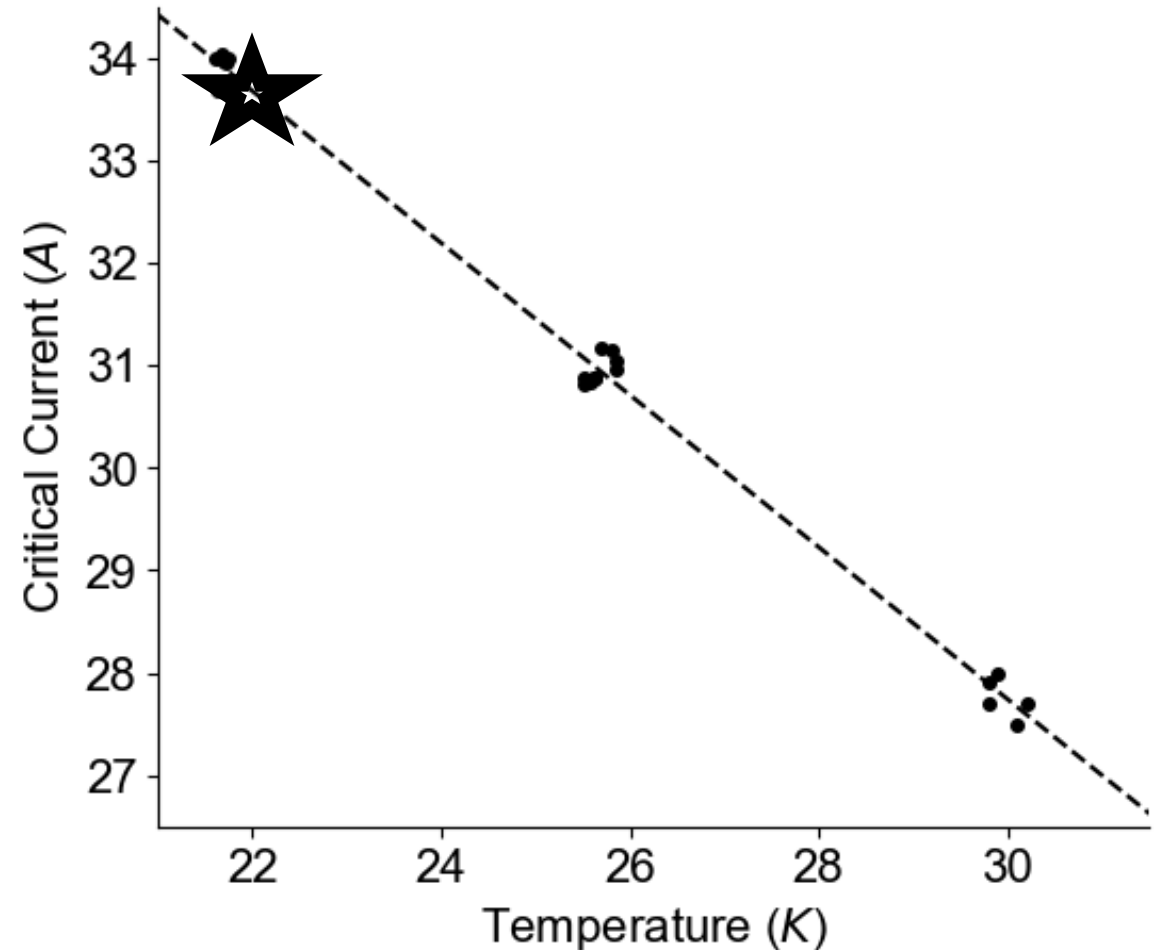


# Analyze data at **22 K**

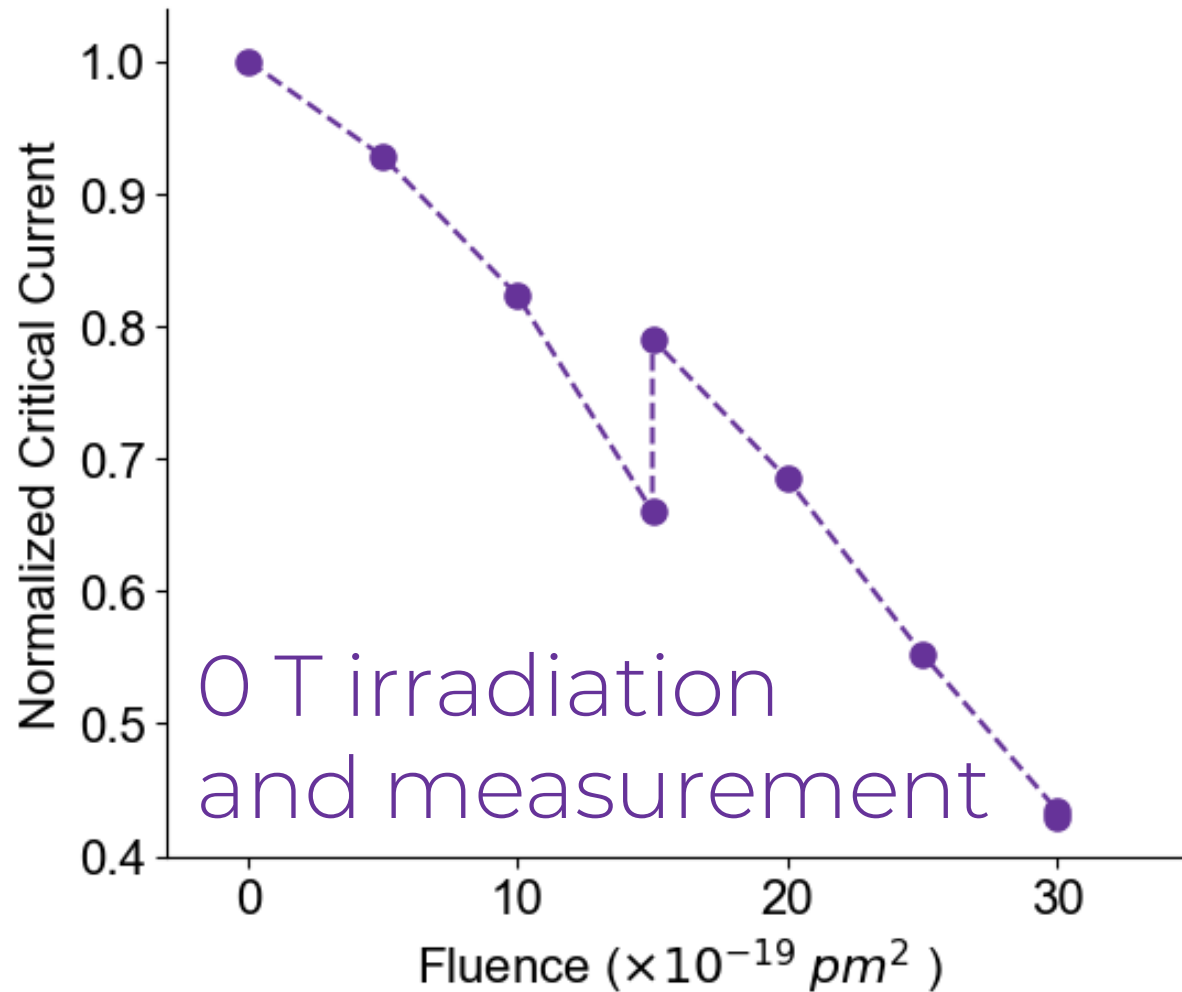
For each value, plot  $I_c$ s  
collected between  
20 – 30 K

Add linear fit

Solve for 22 K



# Altering field mid-irradiation



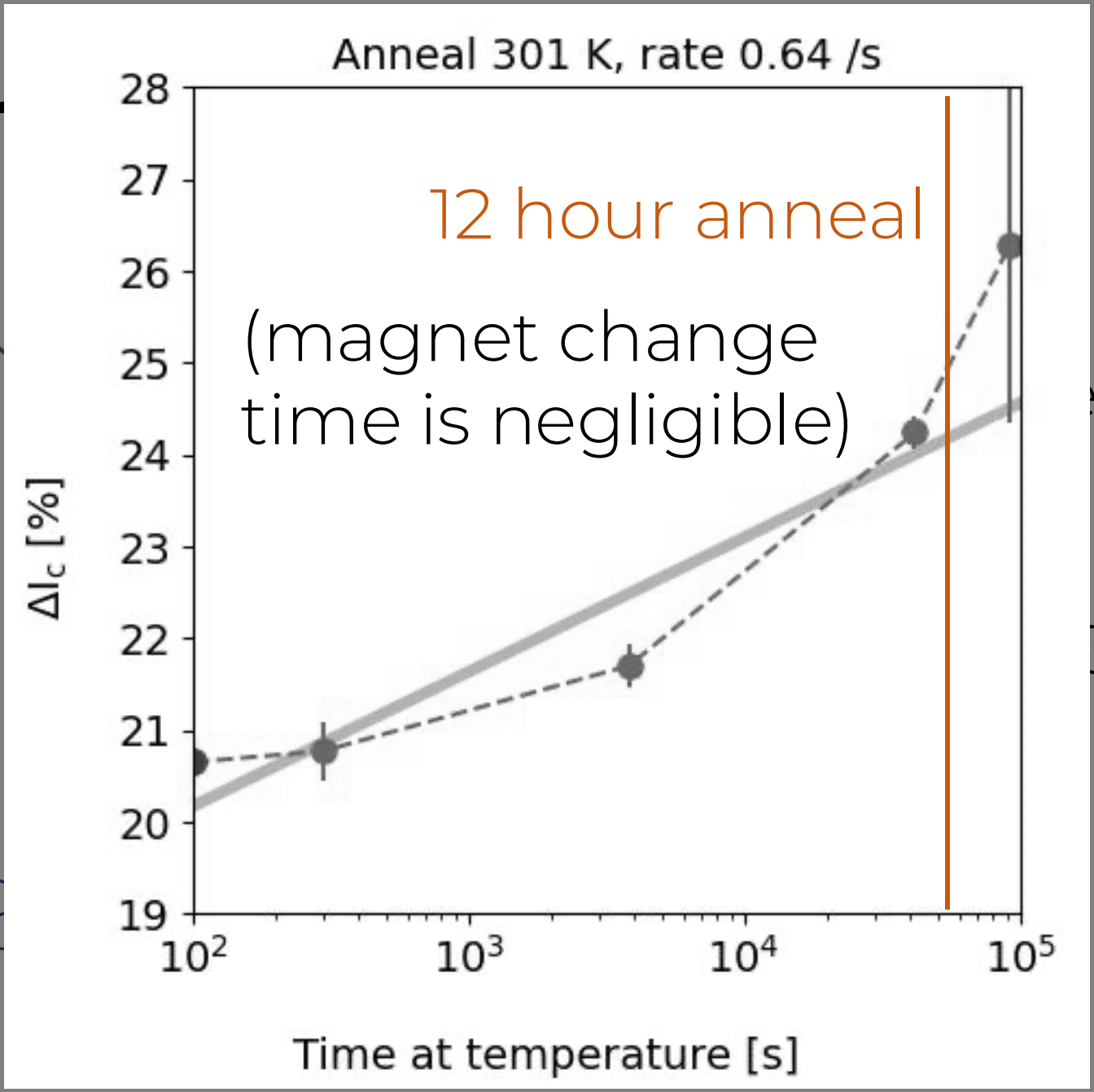
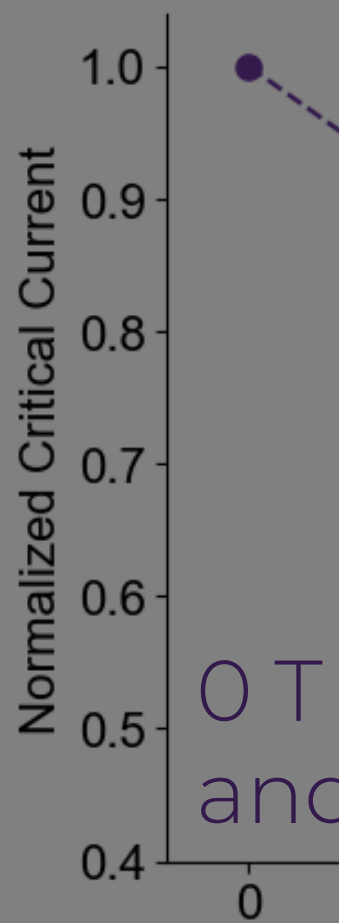
Magnet must be changed manually



Anneal to 300 K

- X 0.33 T measurement
- 0 T measurement
- 0.33 T irradiation
- 0 T irradiation

# Alterin

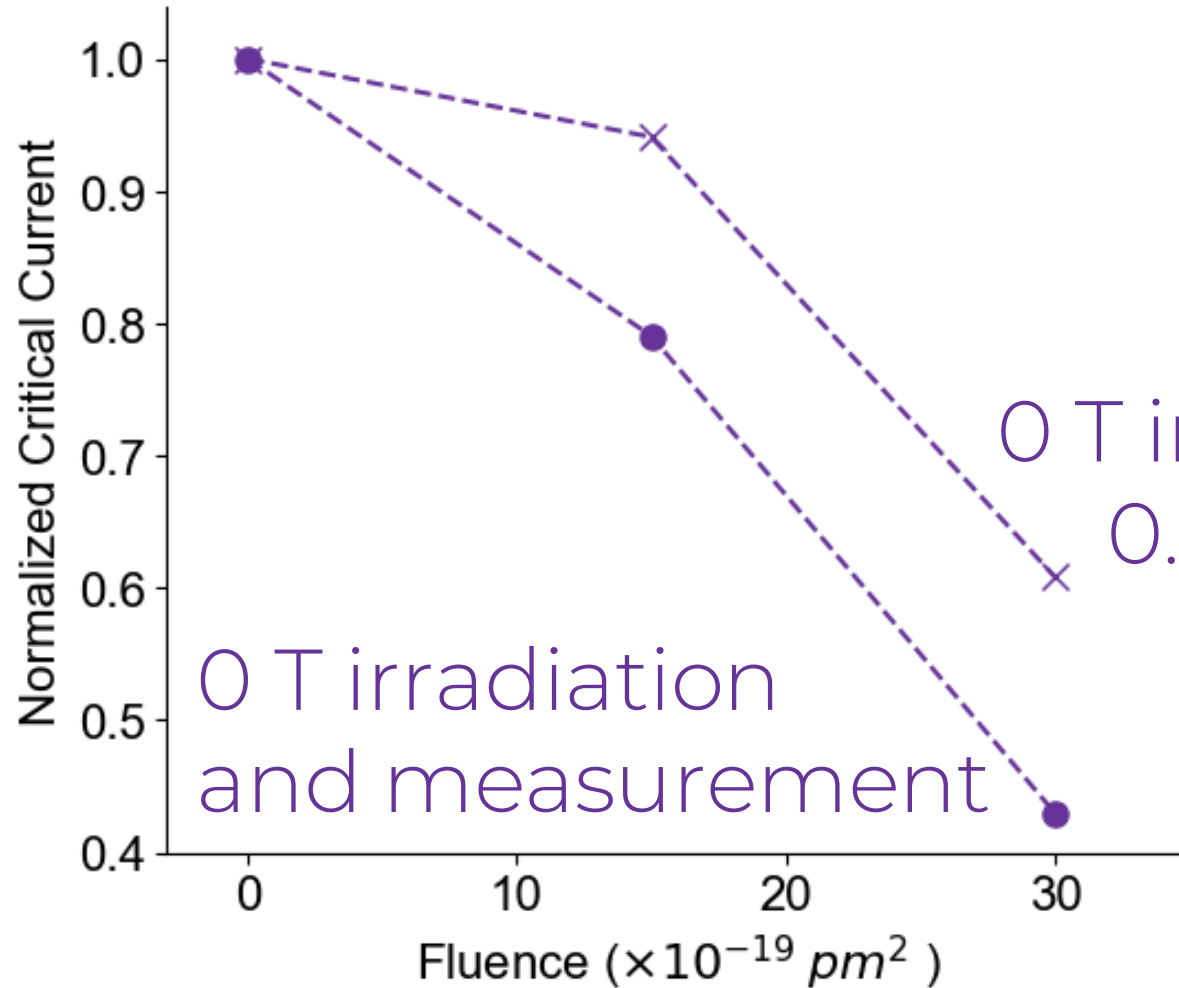


ust  
d manually

300 K

- x 0.33 T measurement
- 0 T measurement
- 0.33 T irradiation
- 0 T irradiation

# 0 T irradiation



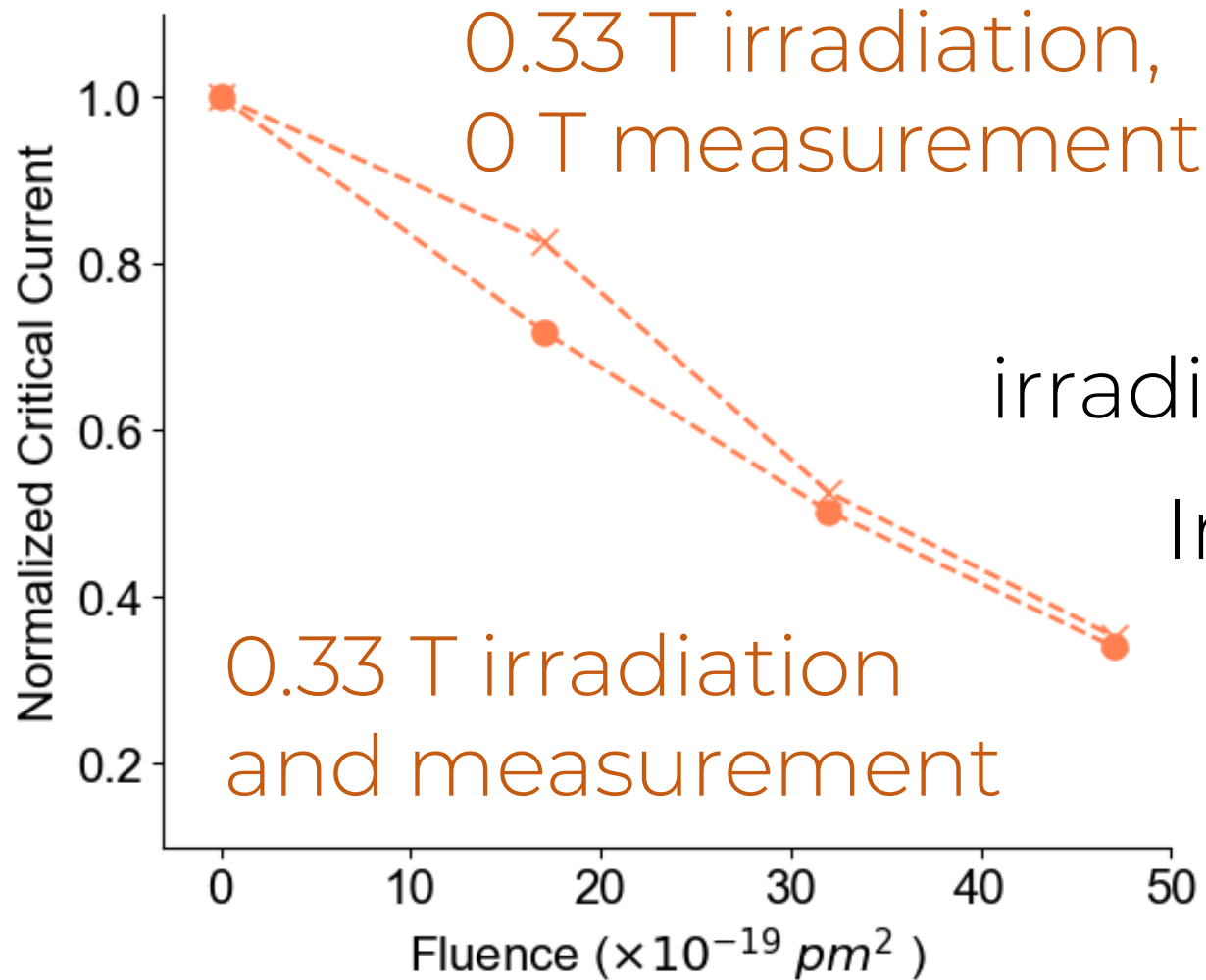
In-field  $I_c >$  self-field  $I_c$   
normalized, irradiated in  
same field

0 T irradiation,  
0.33 T measurement

0 T irradiation  
and measurement

- X 0.33 T measurement
- 0 T measurement
- 0.33 T irradiation
- 0 T irradiation

# 0.33 T irradiation

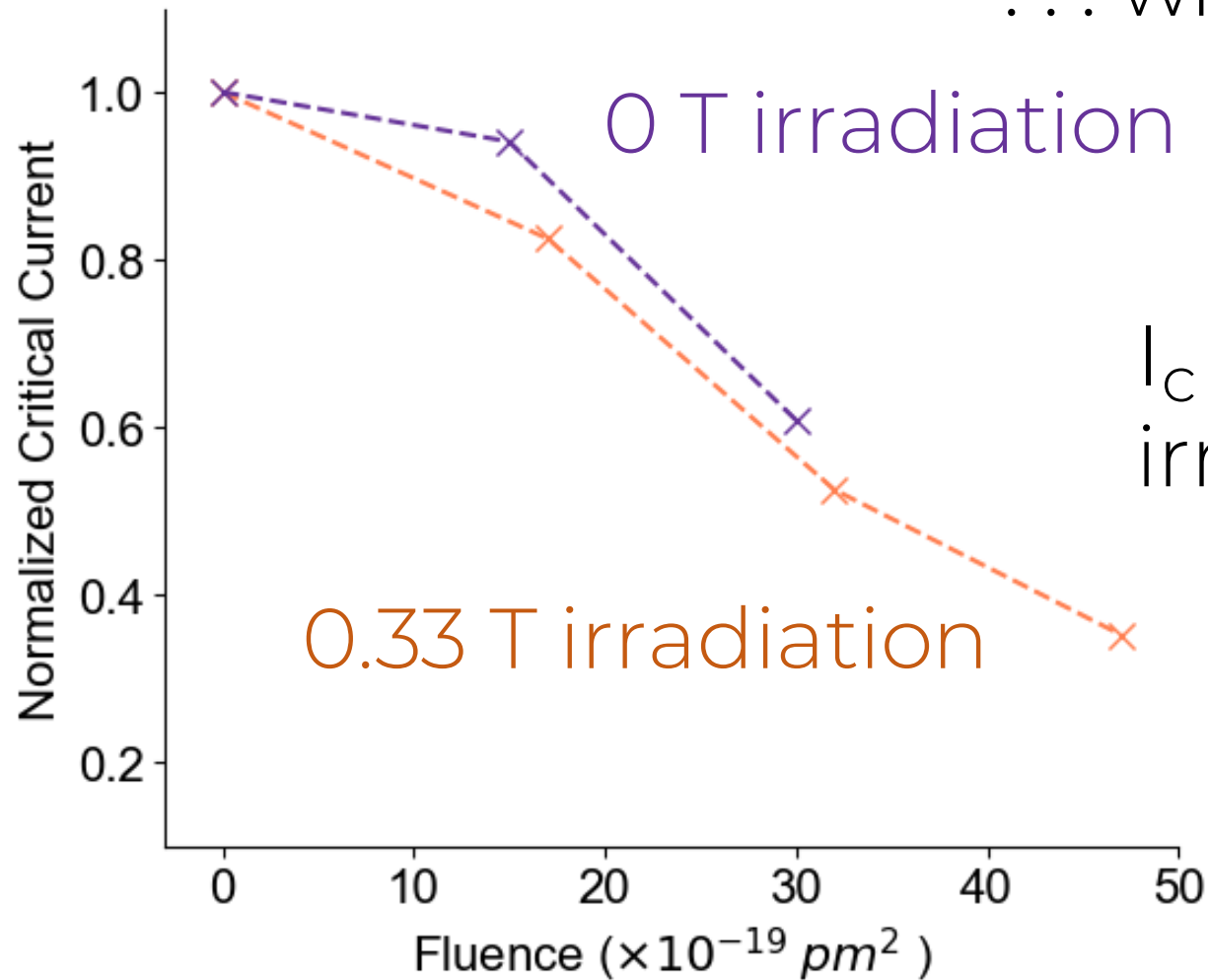


Again,  
when normalized and  
irradiated in same conditions,  
In-field  $I_c >$  self-field  $I_c$

- x 0.33 T measurement
- 0 T measurement
- 0.33 T irradiation
- 0 T irradiation

# Compare irradiations

... with 0.33 T measurements

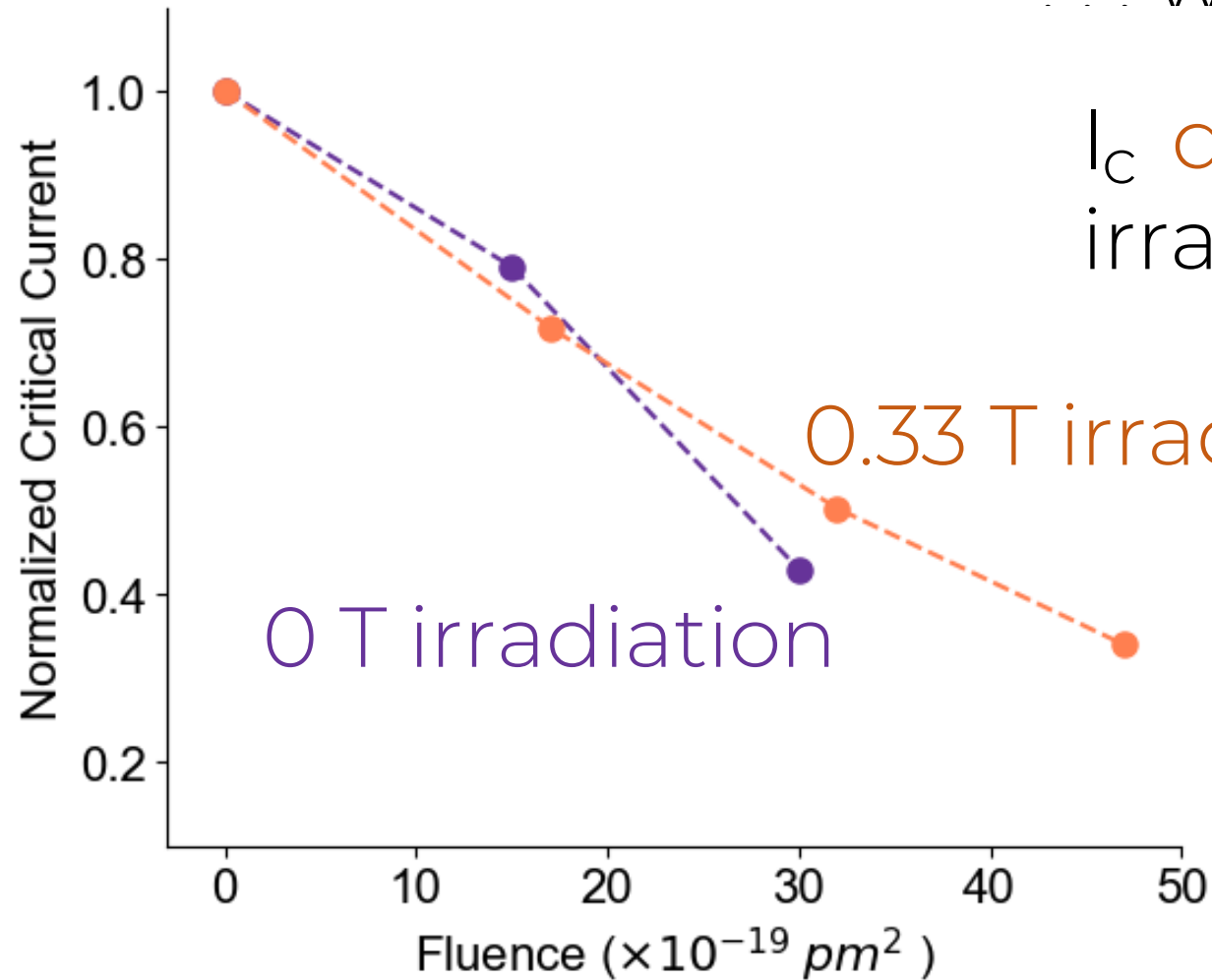


$I_c$  degrades faster in 0.33 T irradiated sample

- X 0.33 T measurement
- 0 T measurement
- 0.33 T irradiation
- 0 T irradiation

# Compare irradiations

with 0 T measurements



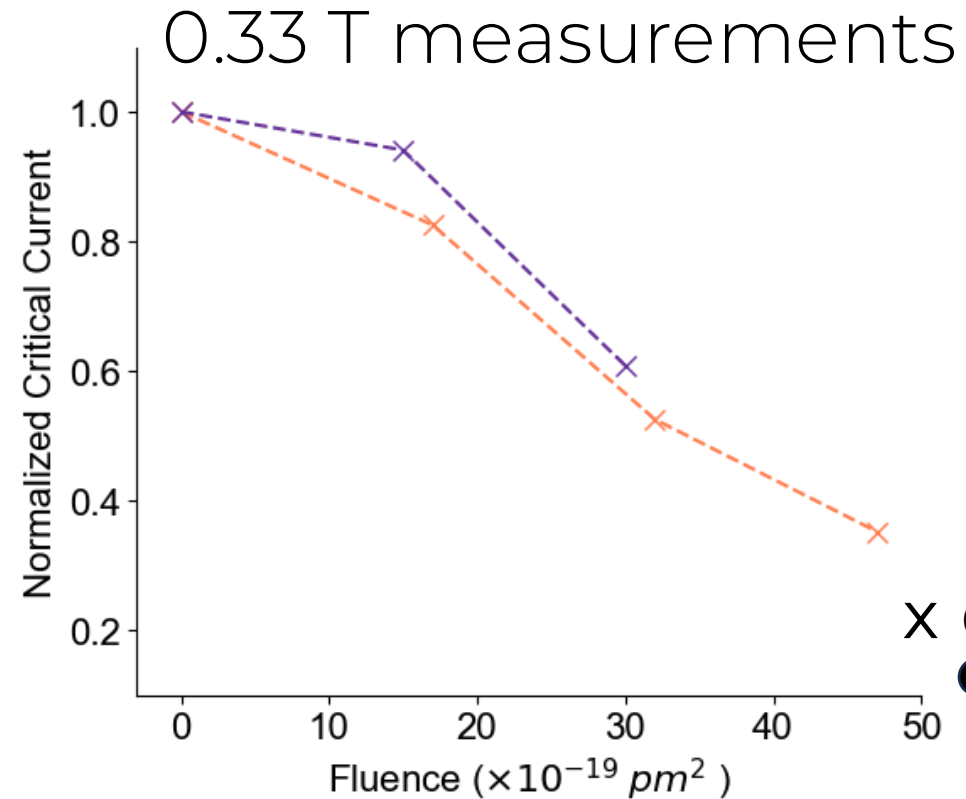
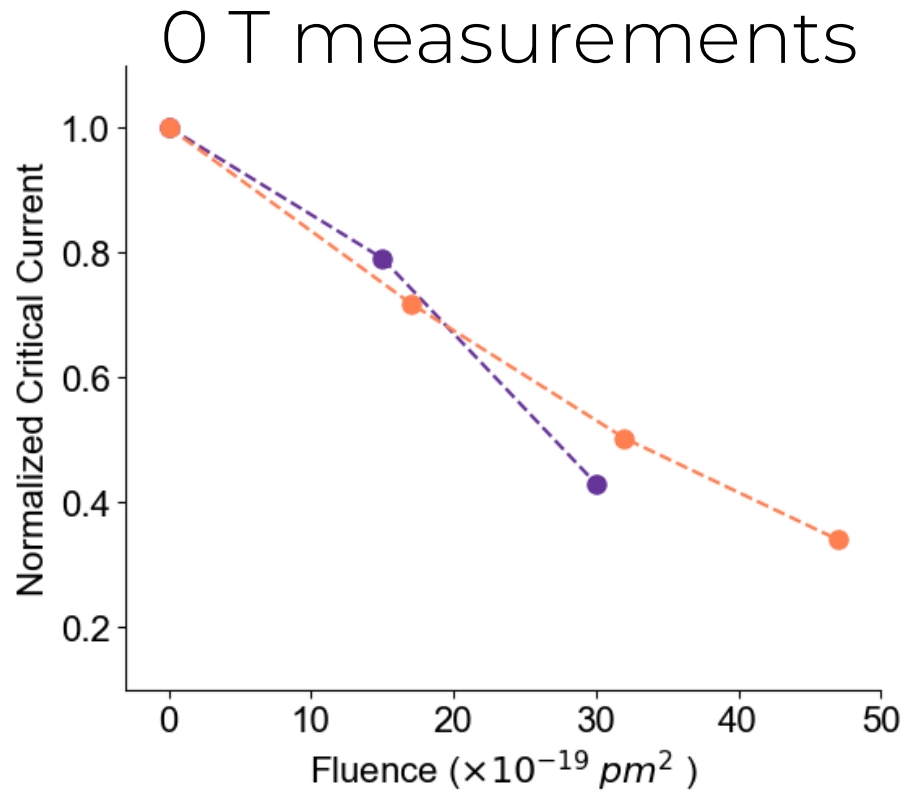
$I_c$  degrades faster in 0.33 T irradiated sample

0.33 T irradiation

0 T irradiation

- X 0.33 T measurement
- 0 T measurement
- 0.33 T irradiation
- 0 T irradiation

# Degradation may be faster in background **field** irradiations



- X 0.33 T measurement
- 0 T measurement
- 0.33 T irradiation
- 0 T irradiation

# Why might **degradation be faster** in background field irradiations?

Not enough data to make this claim – we must repeat this experiment.

Test more fusion-relevant magnetic fields

