The Future of the Advanced Light Source

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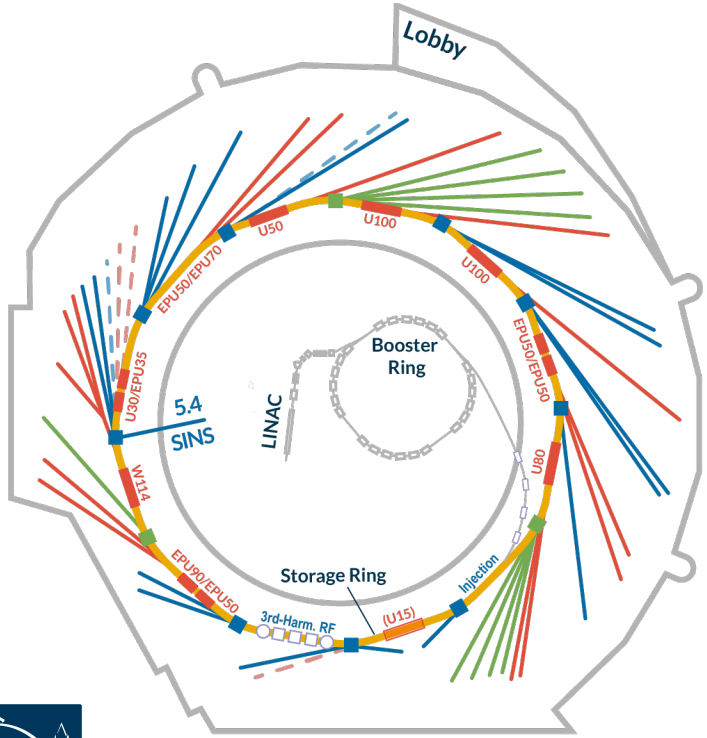
Director of Communications
Advanced Light Source

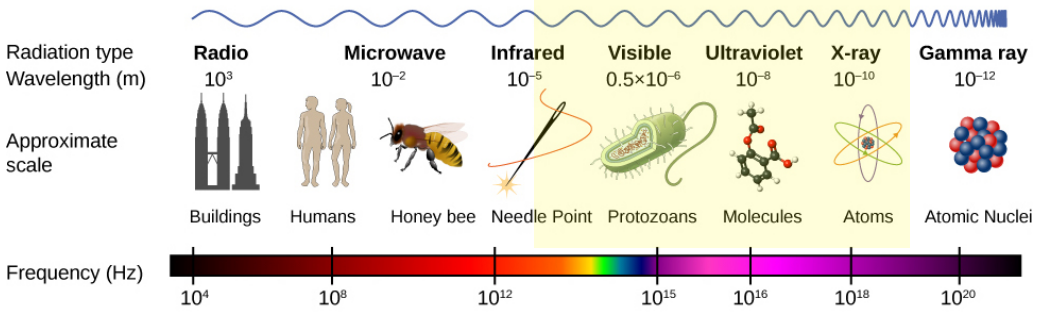
BERKELEY LAB

U.S. DEPARTMENT OF ENERGY | Office of Science

What is the ALS?

1 – The ALS is a synchrotron light source





ALS
ADVANCED LIGHT SOURCE

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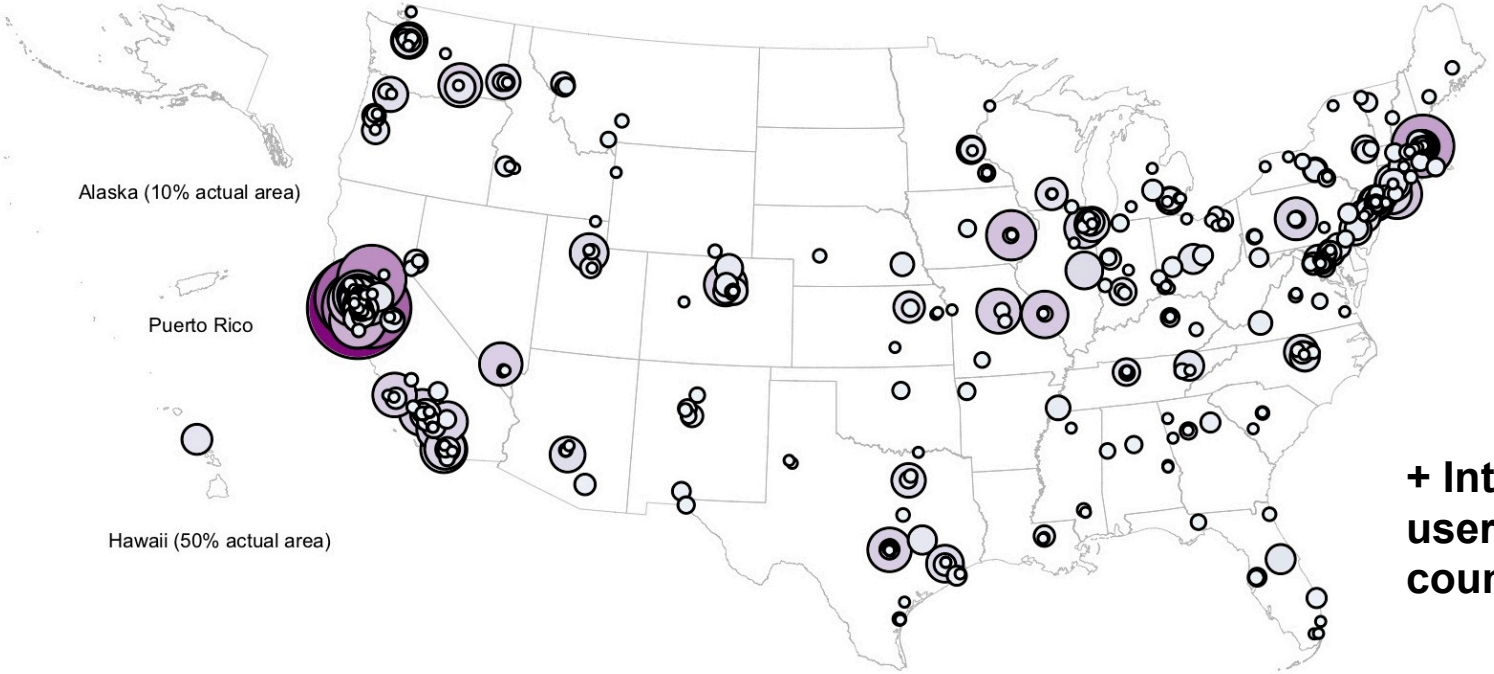
2 – The ALS is a national resource



+ International users from ~40 countries

Distribution of ALS user zip codes, FY15–17

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2 – The ALS is a national resource

ALS (Berkeley)
2 GeV, soft x-rays

APS (Argonne)
6 GeV, hard x-rays

NSLS II
(Brookhaven)
3 GeV

SSRL (SLAC), 3 GeV

LCLS (SLAC)

2 – The ALS is a national resource

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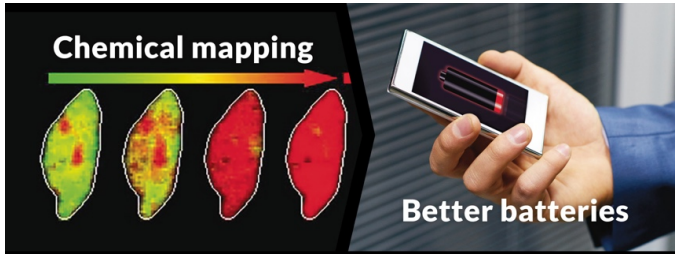
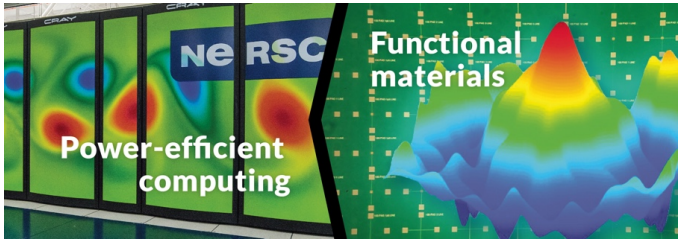
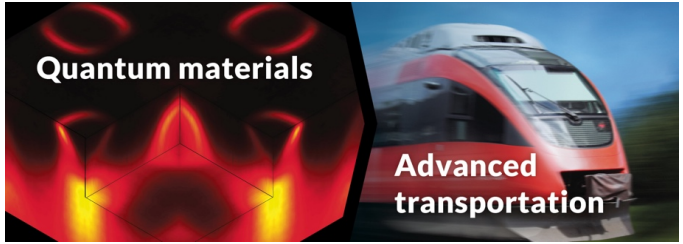
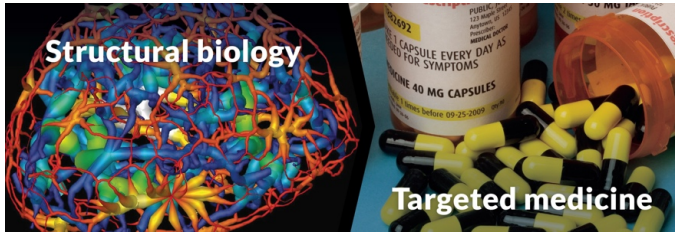
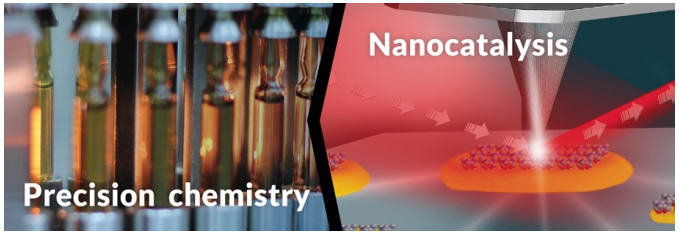
3 – The ALS is a scientific research facility











3 – The ALS is a scientific research facility

Plexxikon

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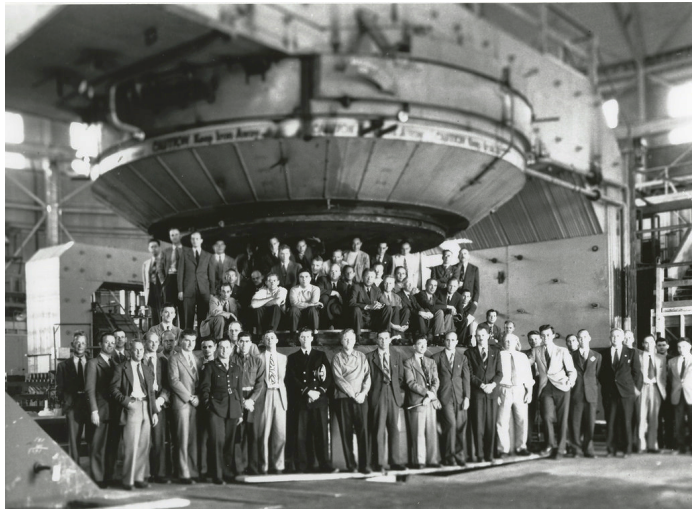
4 – The ALS is a historical landmark



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5 – The ALS is a paragon of team science

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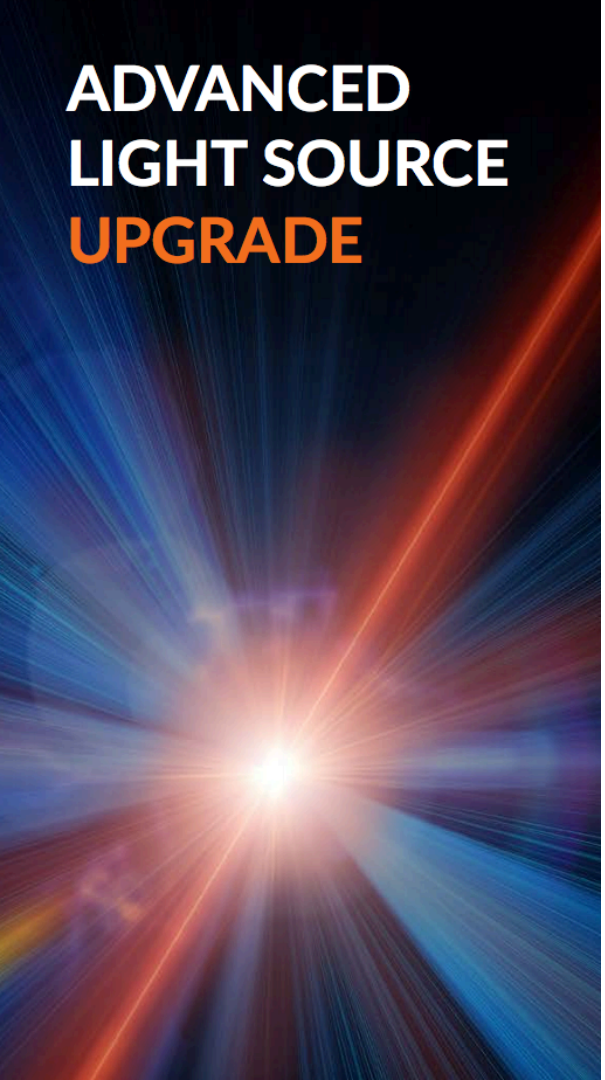
What is ALS-U?



ALS-U is a long-term project to upgrade the ALS.

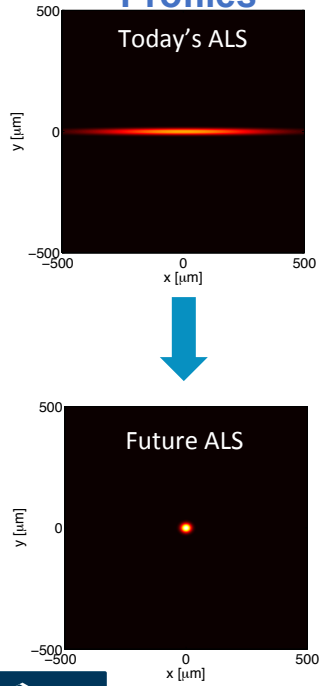
The upgraded facility would provide more than **100x** higher soft x-ray brightness and coherent flux than today's ALS.

ALS-U is Berkeley Lab's top priority project.

Why upgrade？

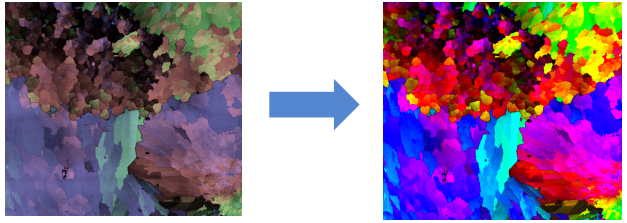
1 – To greatly enhance ALS capabilities

Electron Beam Profiles

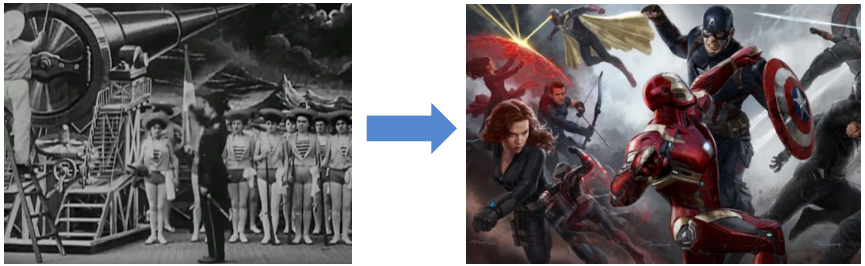


High-resolution, nanoscale imaging

High spectral sensitivity

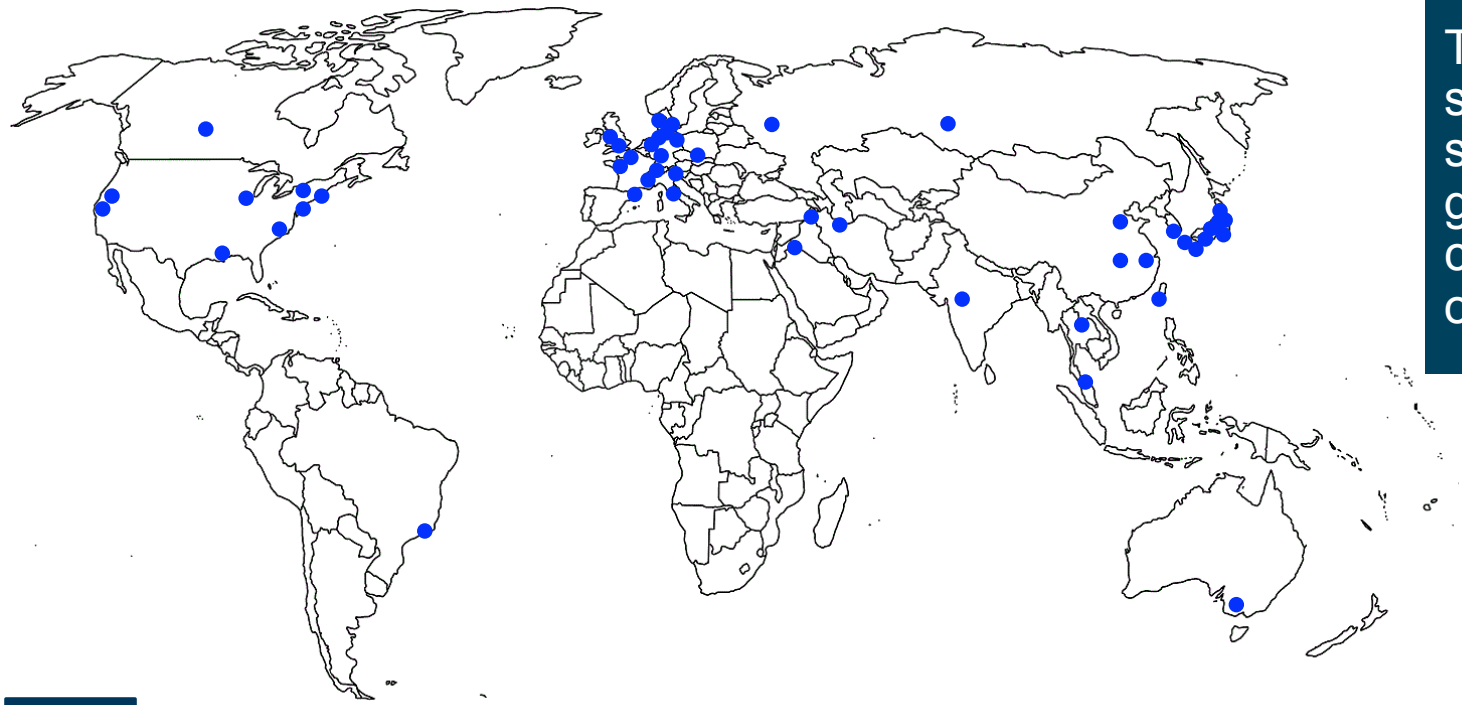


Broad space and time scales



All at the same time!

2 – To stay internationally competitive



There are ~50 synchrotron light sources across the globe, either currently operating or in development.

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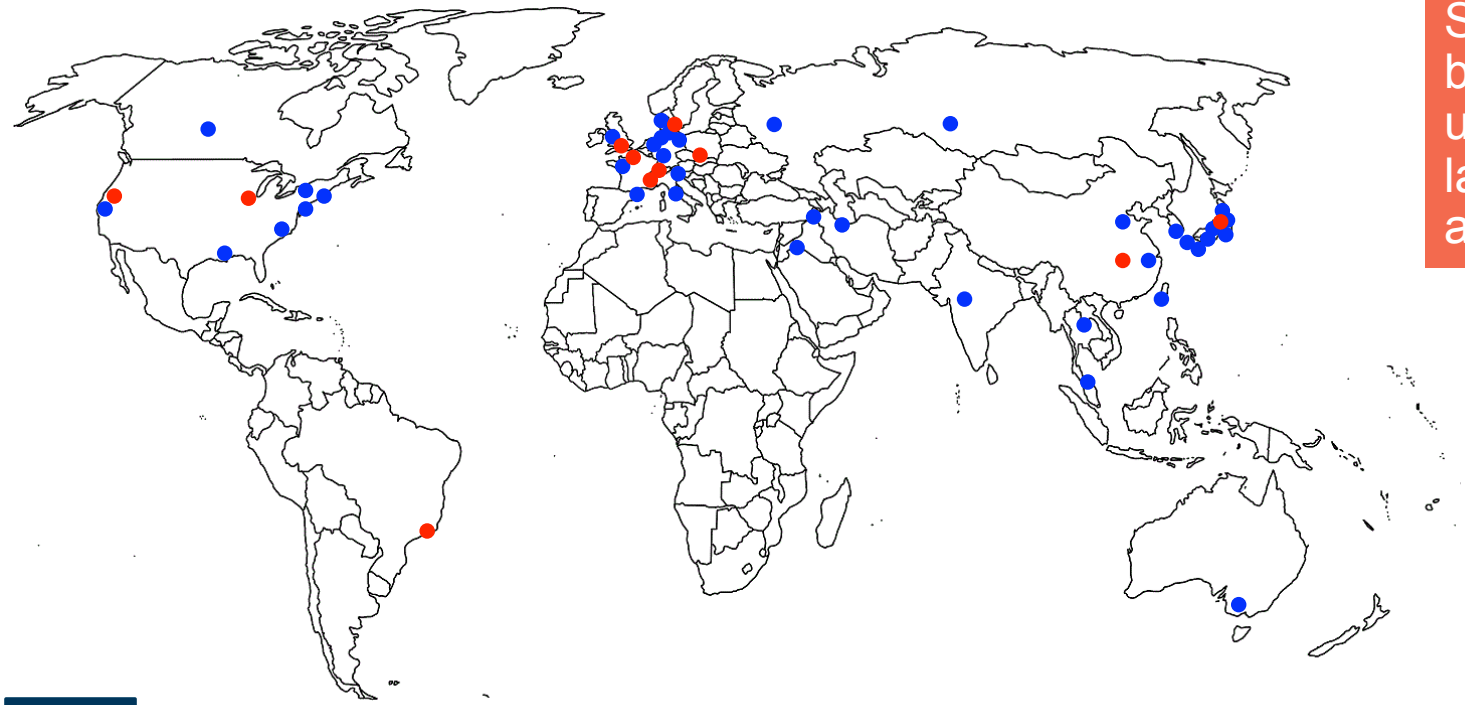
2 – To stay internationally competitive



Some are being built new or are upgrading to the latest technologies available.

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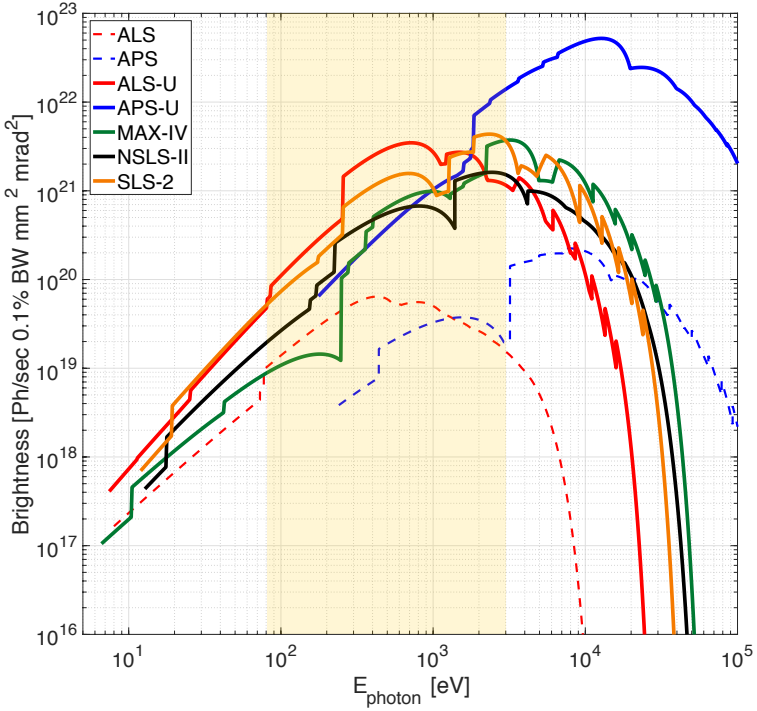
3 – To continue to do world-leading science

Brightness



Brightness is the metric of a source that determines the achievable, spectral, spatial, and temporal resolution.

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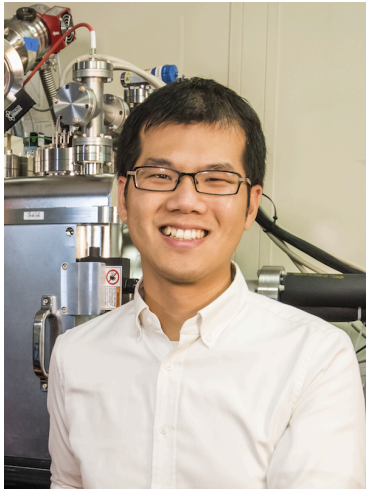
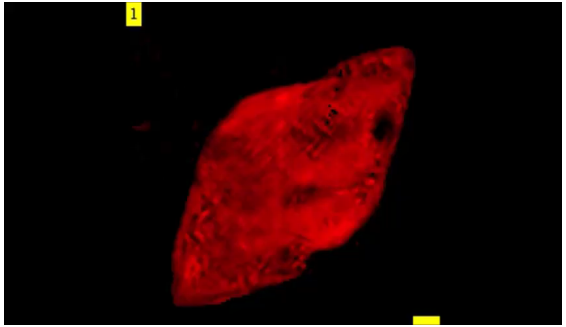
Faster-charging, longer-lasting batteries



Will Chueh, Stanford University



	30 nm	10 nm	3 nm
ALS	180 s	4 hours	23 days
ALS-U	1.8 s	144 s	5 hours

X-ray exposure time required to image this battery particle in 3D with full spectral coverage.

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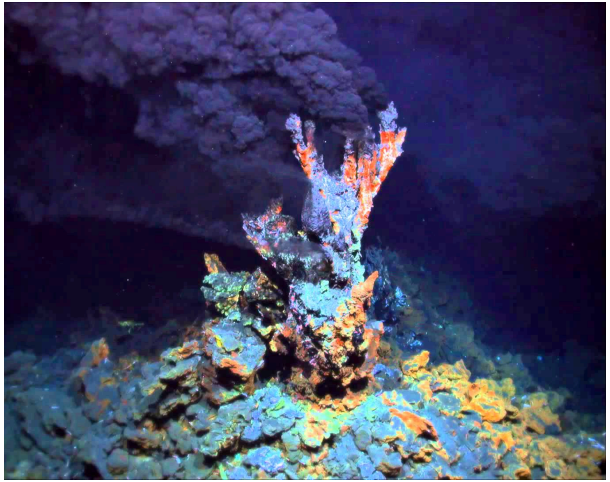
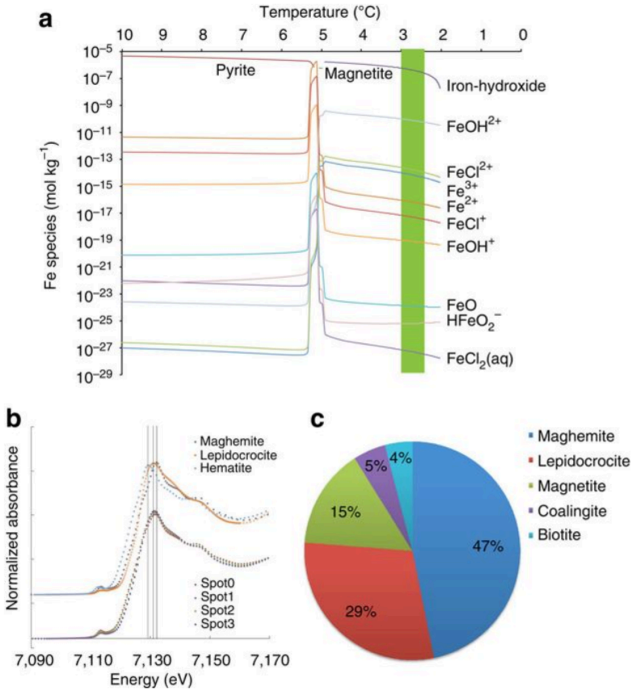
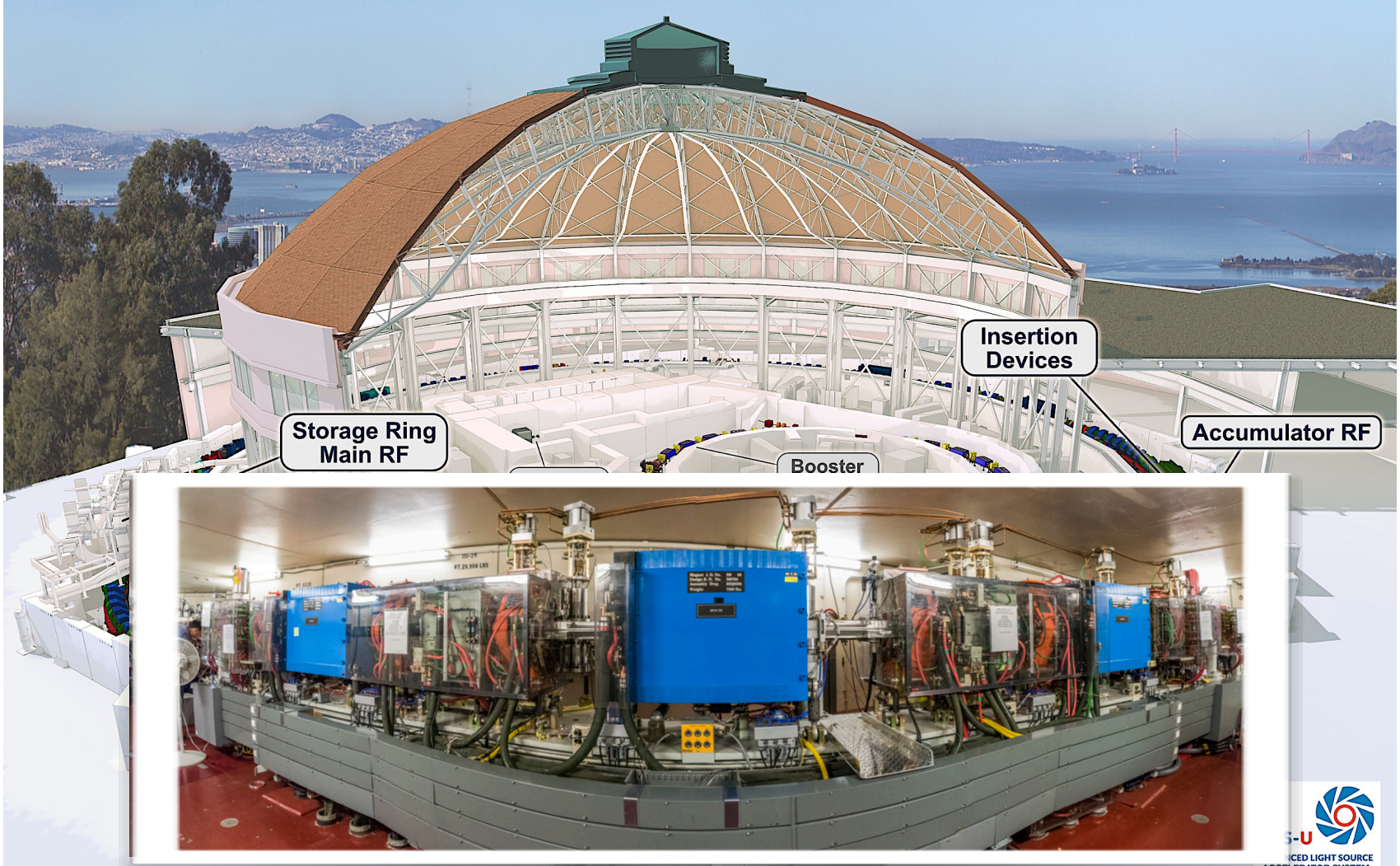
A better global climate model

Brandy Toner, University of Minnesota





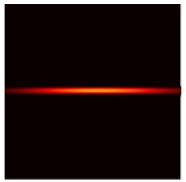
What does the upgrade entail?

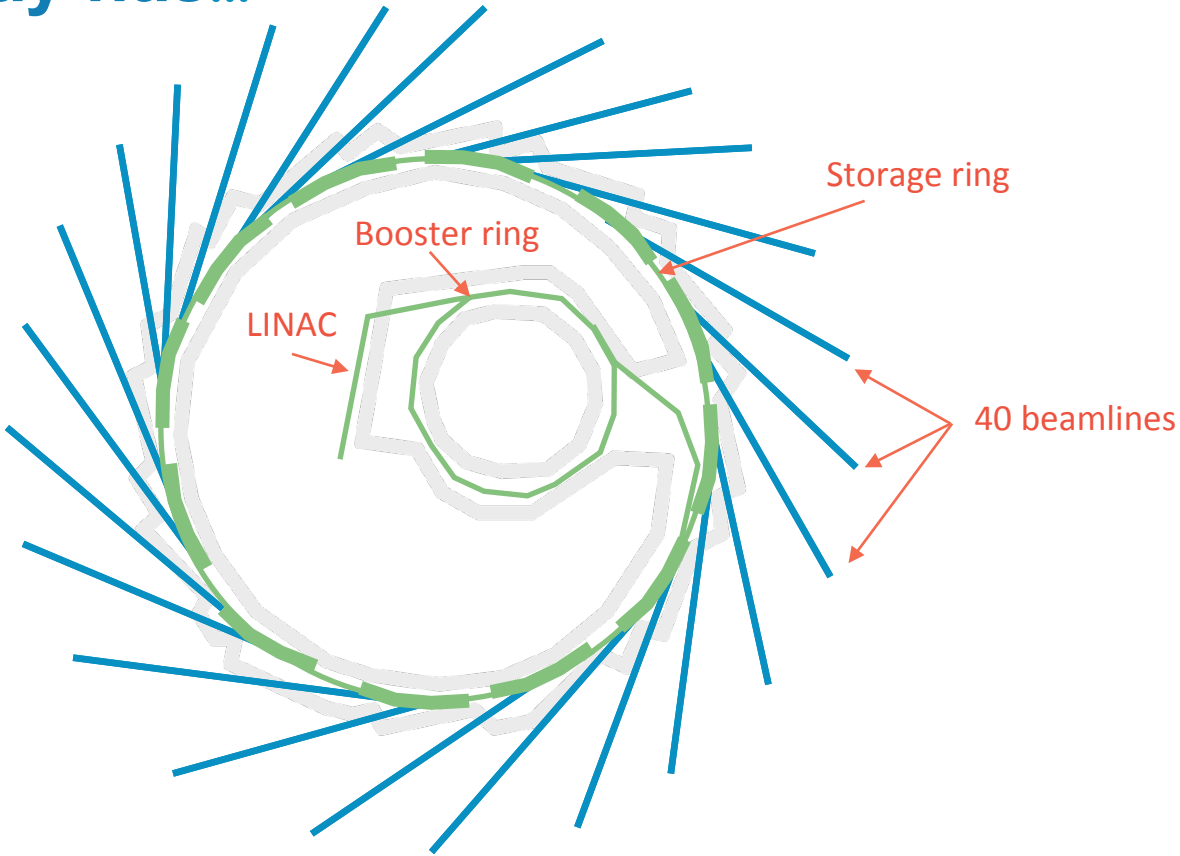


S-U
NCED LIGHT SOURCE
ACCELERATOR SYSTEM

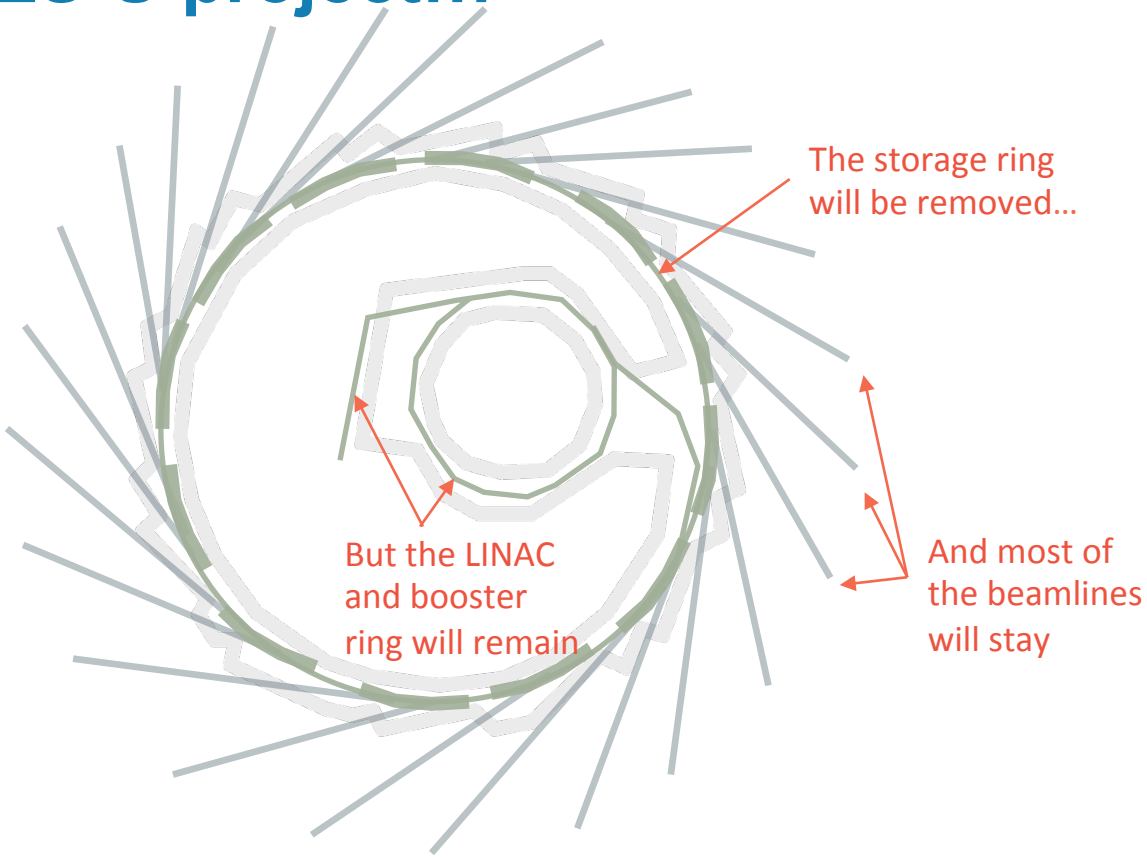
The ALS today has…

Thin, wide electron beam profile

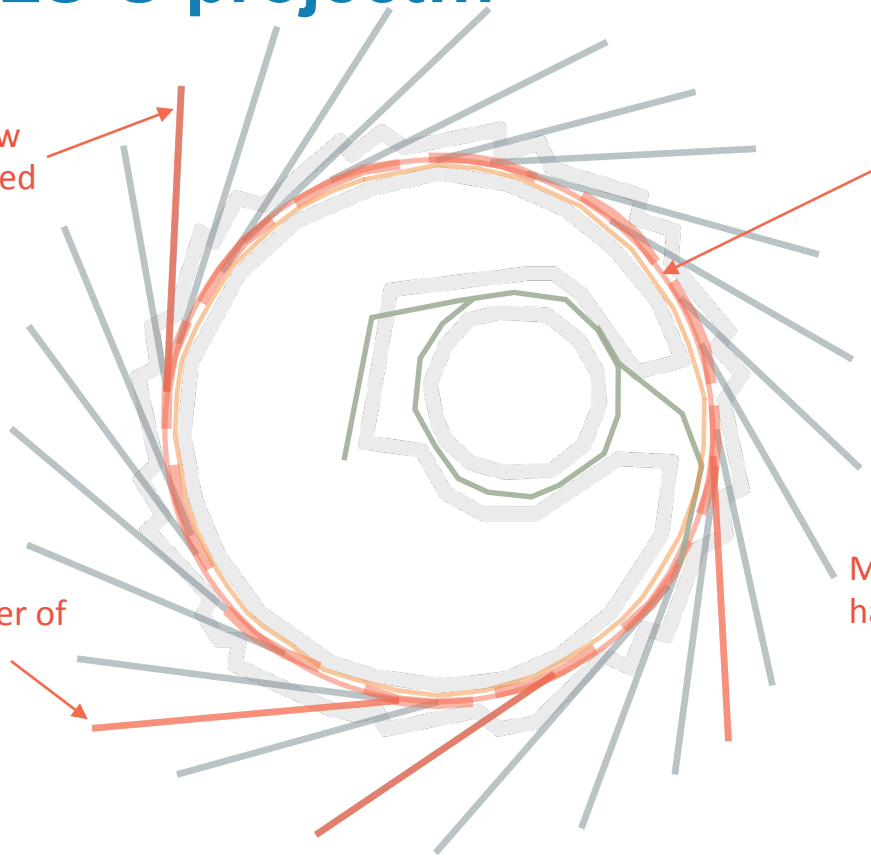




During the ALS-U project…



During the ALS-U project…



A small number of new beamlines will be added

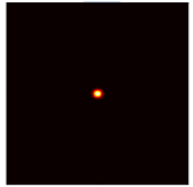
A new storage ring will be built, based on the latest technologies, and a second ring called an “accumulator” will be added.

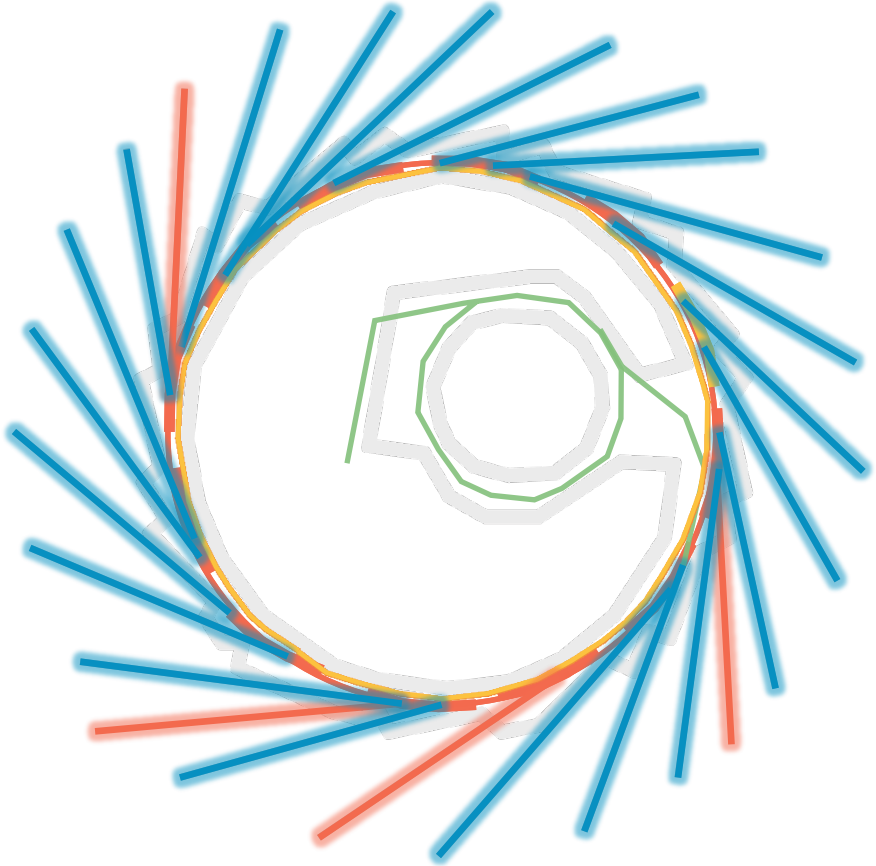
Many beamlines will have to be realigned

And a small number of beamlines will be upgraded

When powered back on, the new ring will offer higher brightness and coherent flux

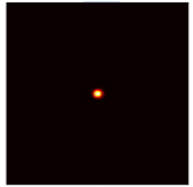
Small, round electron beam profile

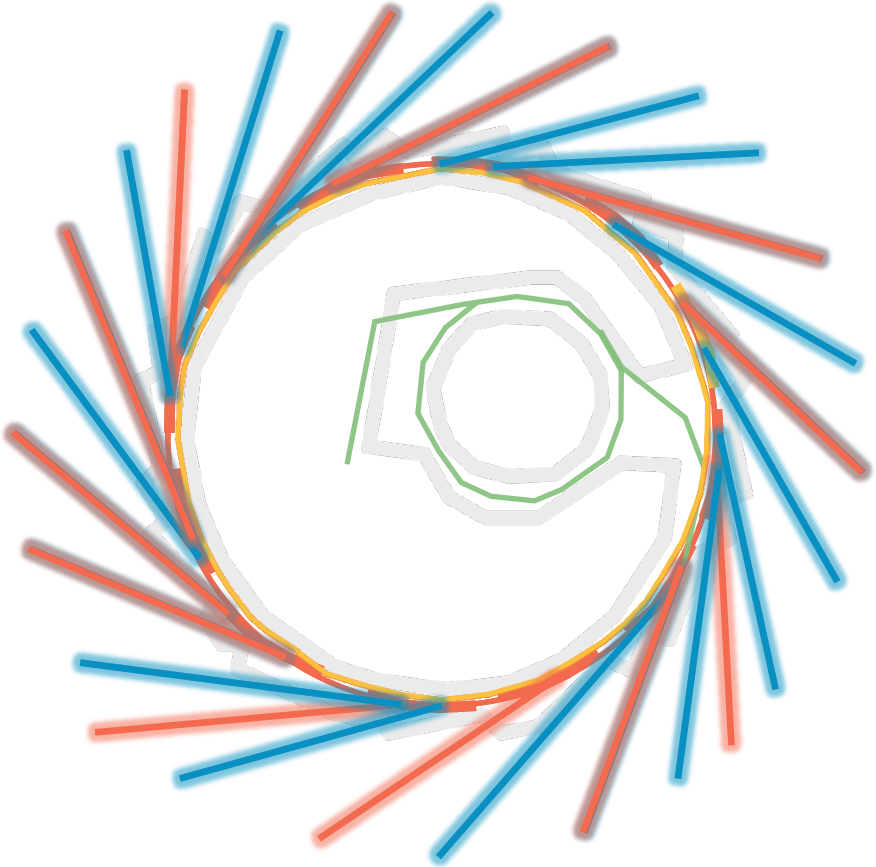




ALS-U will renew the ALS for decades to come, as it continues to innovate

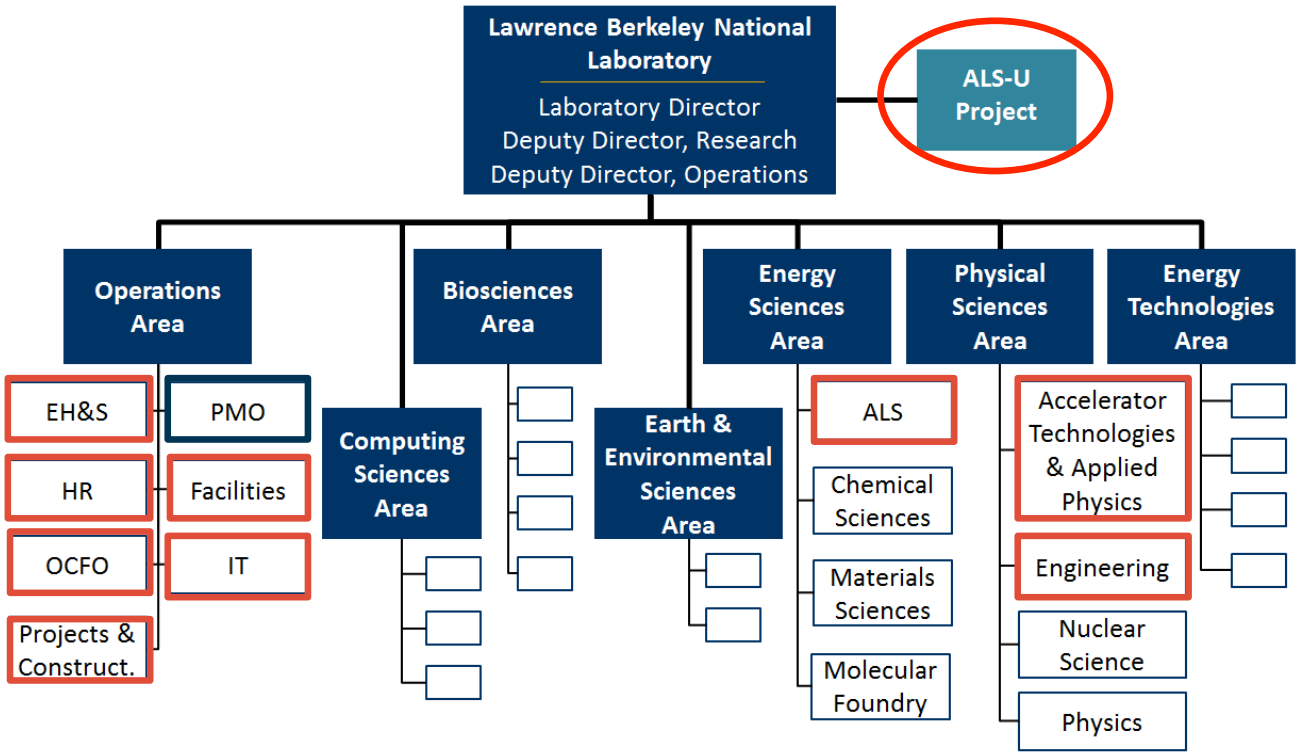
Small, round electron beam profile





Who’s involved in the upgrade?

ALS-U project within LBNL organization

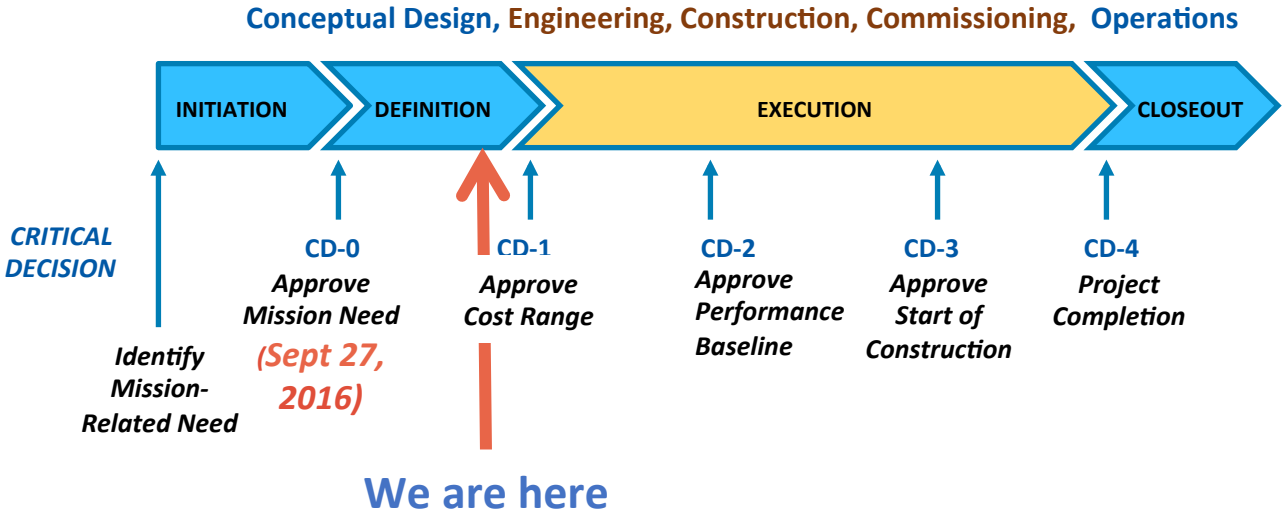


Dave Robin
ALS-U Project Director

Ken Chow
ALS-U Project Manager

Steve Kevan
ALS Director

Stages of a DOE project and where ALS-U is



- We are currently in the conceptual design phase
- Next stage is preliminary design—leads to performance baseline
  - Baseline (CD-2) is when the scope, cost, and schedule are fixed

Received $5M from DOE in FY17 and $30M in FY18

The ALS-U team is ready for CD-1 and beyond!

Thank you!