

Bigger, Faster, Better Resolution: Future TES Technology for SSRL Beamlines

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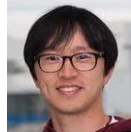
Jun-Sik Lee



Dennis Nordlund



Sang-Jun Lee



Kent Irwin

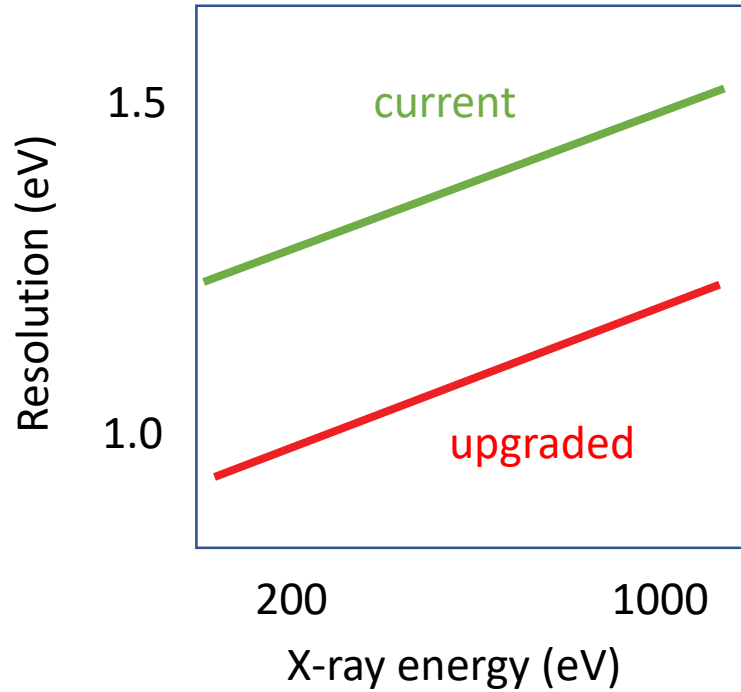


Jamie Titus

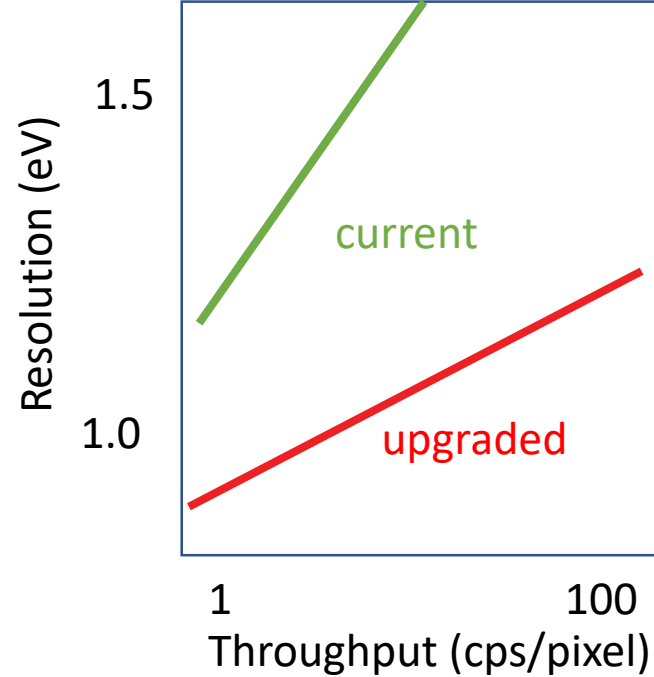


SSRL 10-1 TES Upgrades

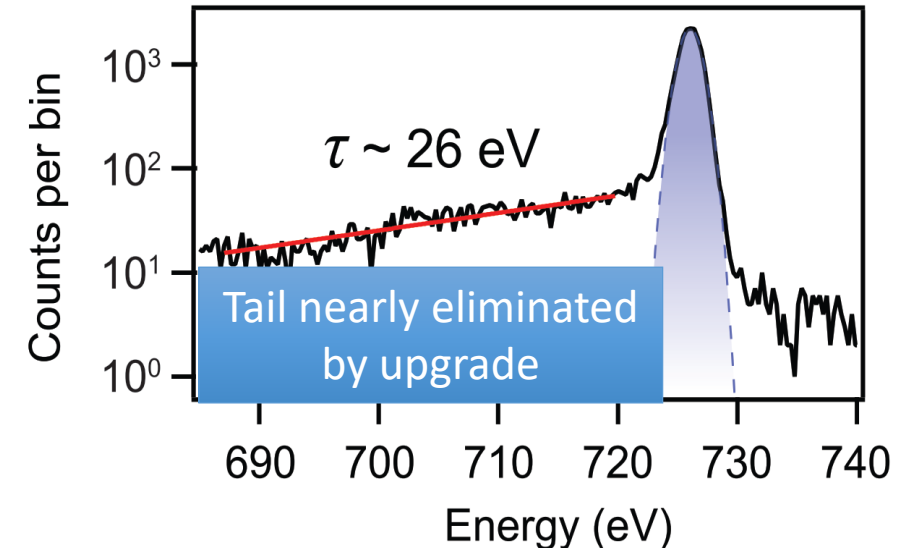
Better resolution
(projection)



Better throughput
(projection)



Better spectral response



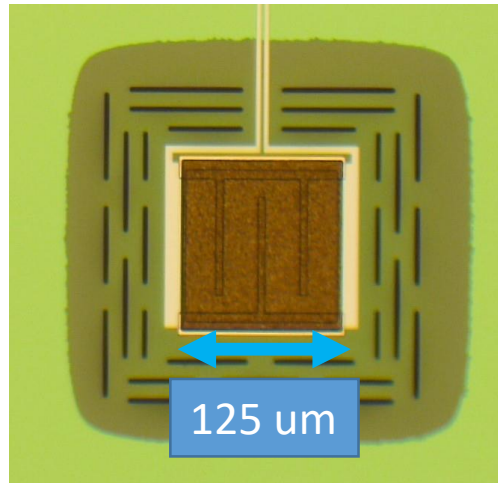
- **5.3x** effective area
- Funding from DOE Basic Energy Science
- Target install date ASAP 2021
- New TES Array + low temperature readout
- ~Better software integration, data plots available instantly

SSRL 10-1 Pixels Compared

resolution

$$\Delta E \propto \sqrt{k_B T^2 C}$$

Current

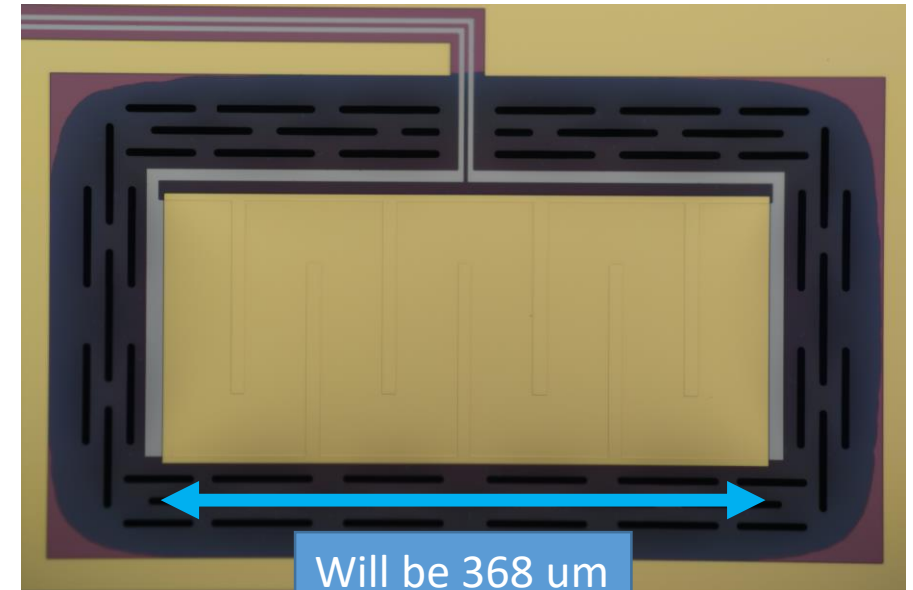


125 um



5.3x effective area

Upgrade 2021



Will be 368 um

Tc ~110mK
Mo/Cu Bilayer
Bi plating

Tc ~75 mK
Mo/Au Bilayer
Au has:

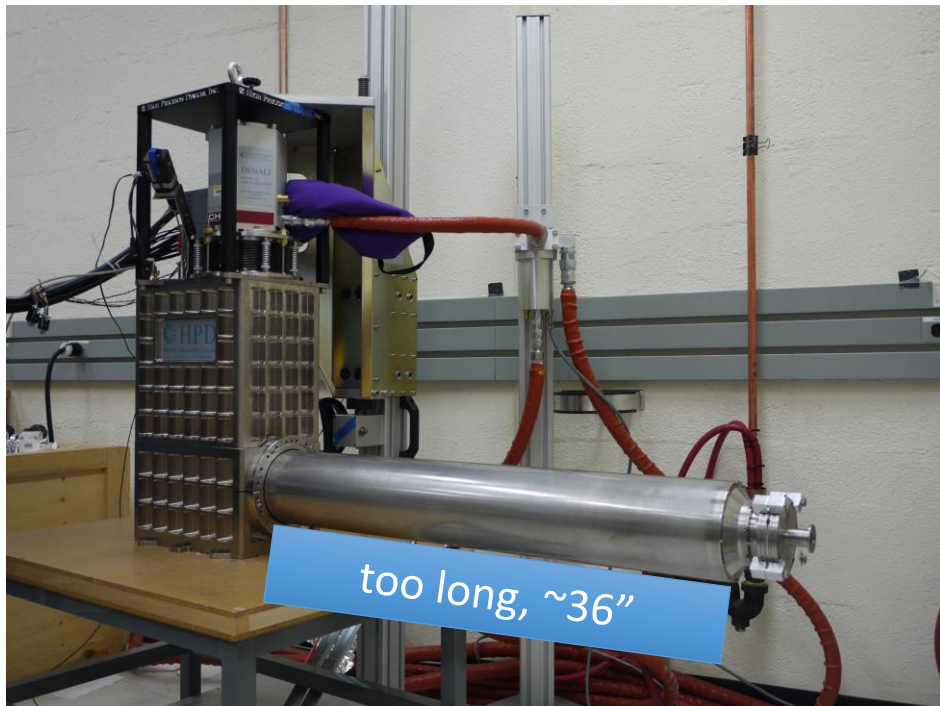
- More area for same heat capacity
- More x-ray stopping power
- More consistent fab

- Weber, 2020, *Superconductor Science and Technology*
- Morgan, 2017 *Applied Physics Letters*

SSRL 13-3 Upgrades

- Would like to follow 10-1, dependent on DOE funding
- Cryogenic improvement: Increase hold time (8->20+ hours)

13-3 now



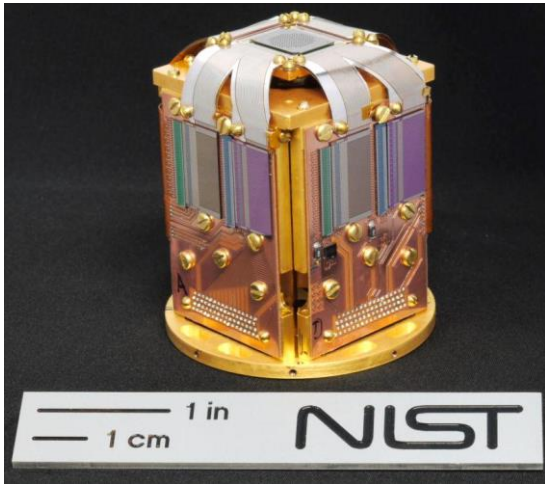
change
to
match
10-1

10-1



UIUC Abbamonte, APS Rodolakis, McCheseny

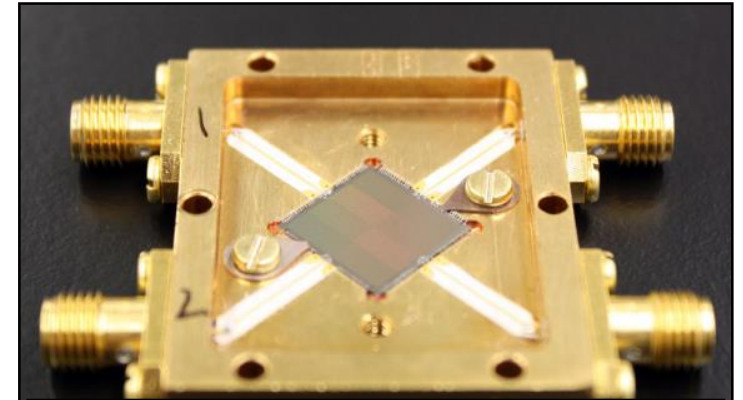
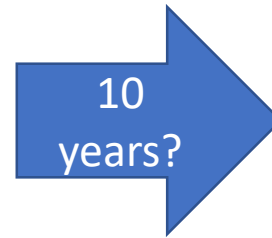
To 10k pixels for LCLS2 and beyond



Space per wirebond $\approx 1/\sqrt{N}$



Tiled arrays



2024 MKID optical spectrometers
Poor x-ray resolving power so far
Image: ARCONS from Mazin group @ UCSB

integral readout with
alternate ucal tech

and/or

