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Micro Grids Fabricated for Miniature Ion Thruster

Deborah French

College of Engineering, Boise State University

Jesse Taff

College of Engineering, Boise State University

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Presented by Deborah French¹ and Jesse Taff³

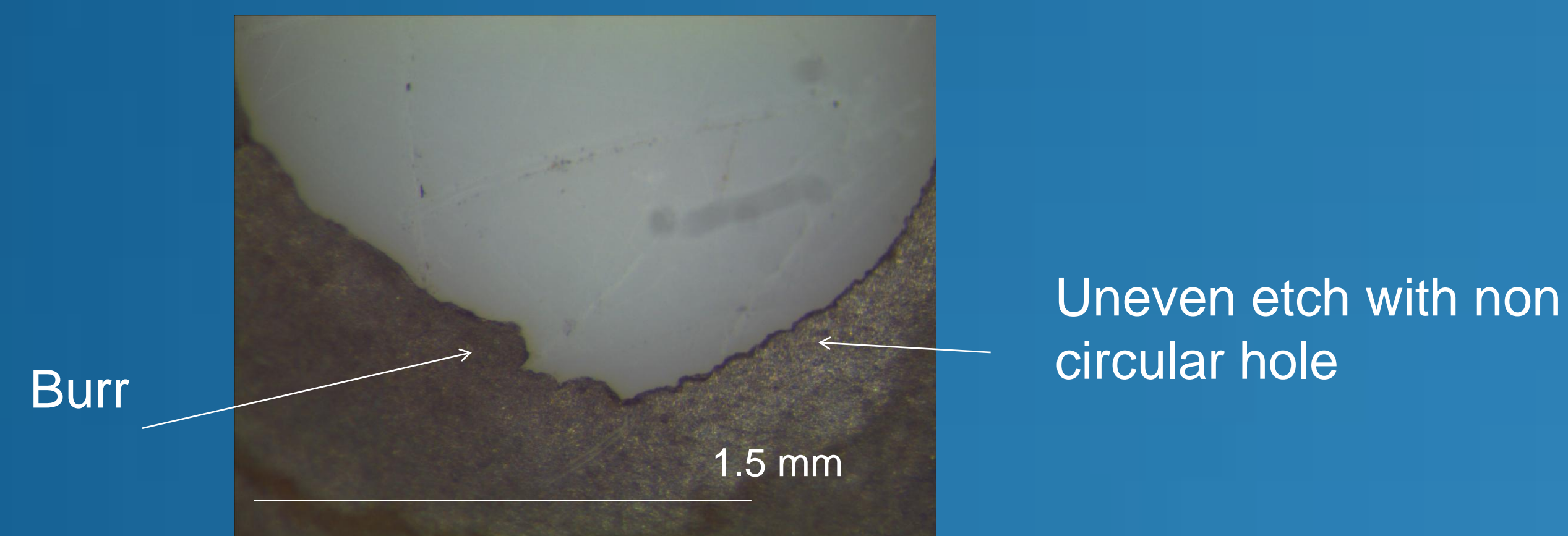
Introduction

- Miniature Ion thrusters are being developed to align microsattellites in orbit
- The micro grid creates an electrostatic field which extracts plasma ions from an Inductively Coupled Plasma (ICP) source
- The assembly contains a stack of two identical grids with attachment tabs:
 - Screen grid for collecting ions
 - Accelerator grid for propelling ions

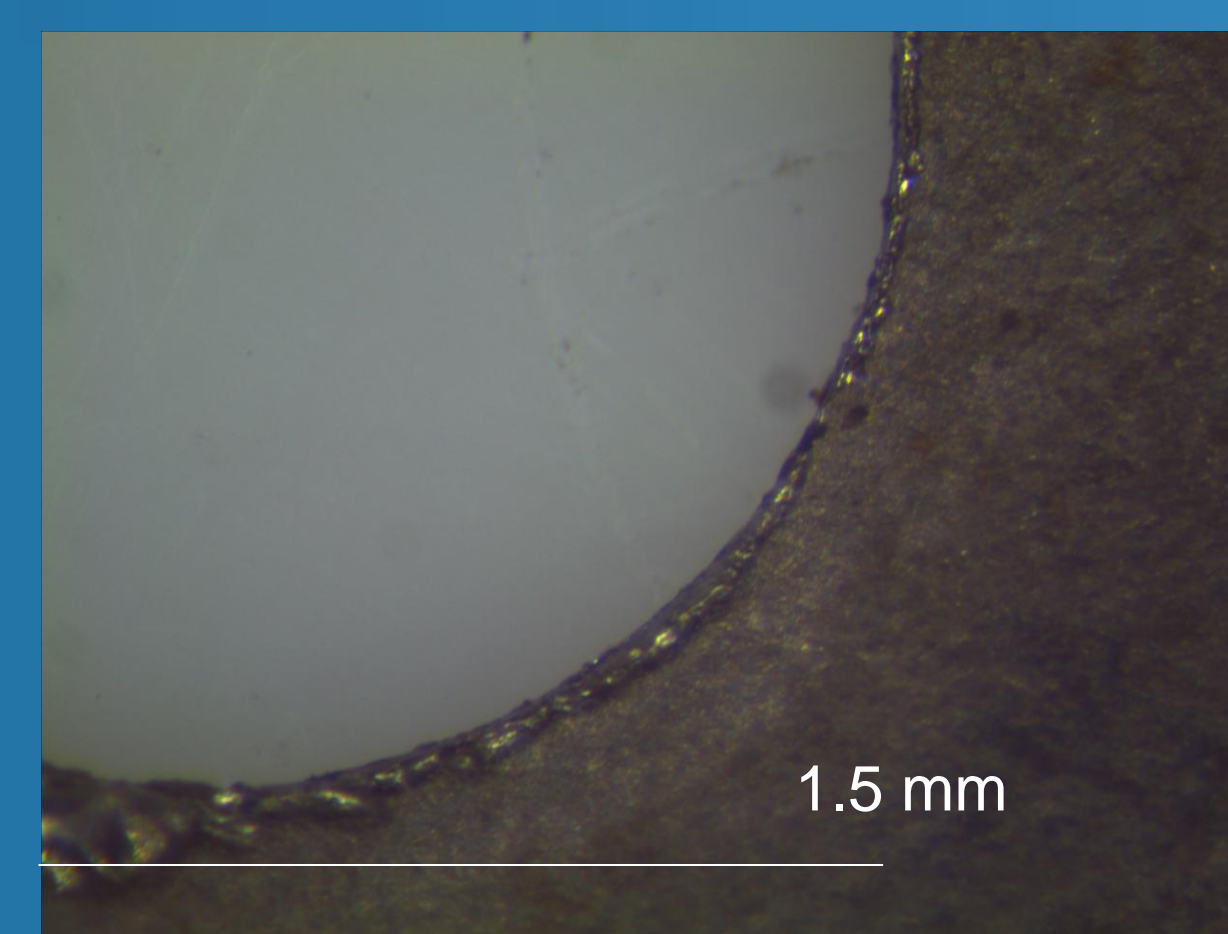
Chemical Etch of Micro Grids

Problems Encountered

- Uneven removal of material
- Creation of burrs and non circular hole
- Burrs create arcing of ions

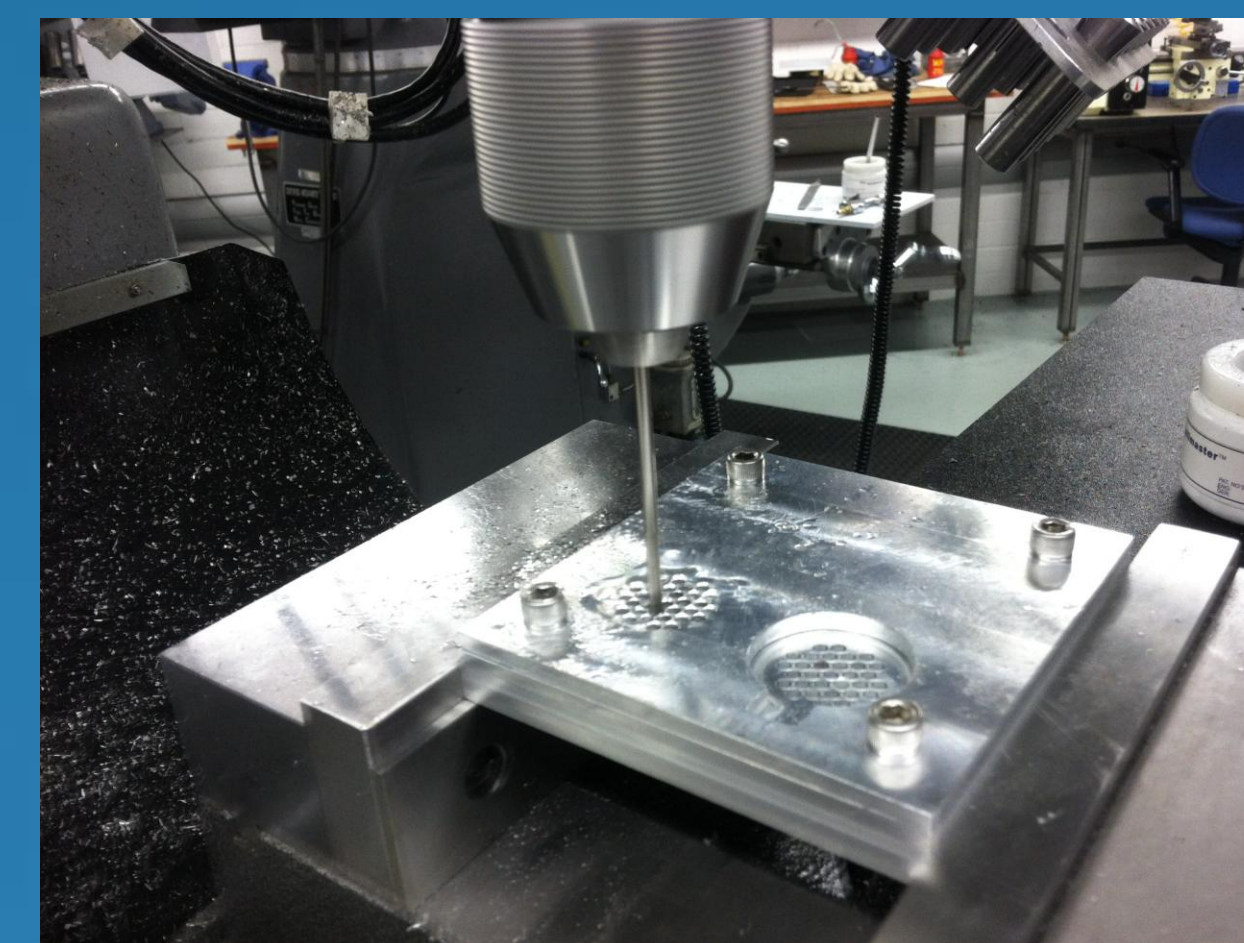
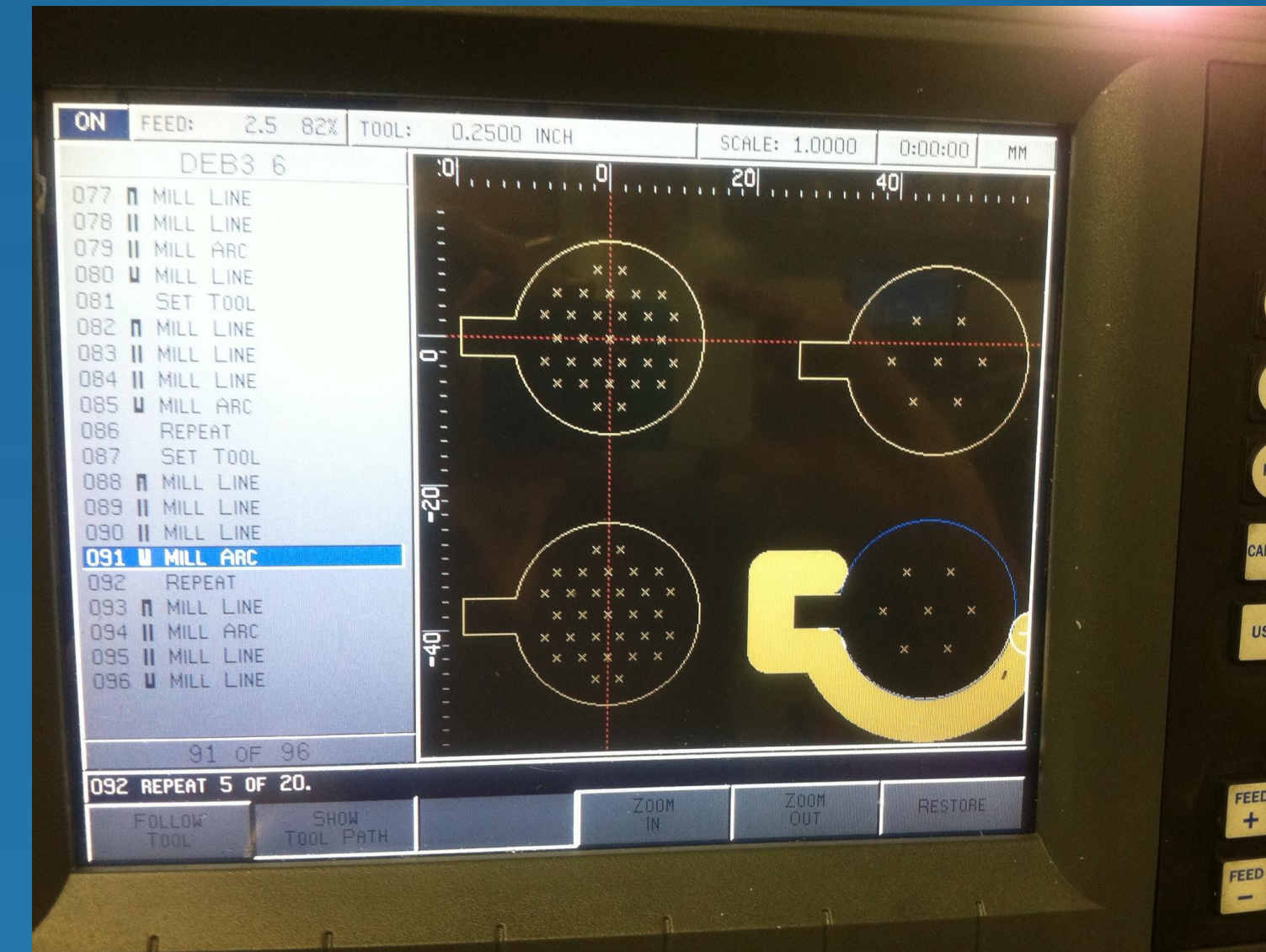


- Removal of burrs were done by hand filing
- Can not remove uneven etch



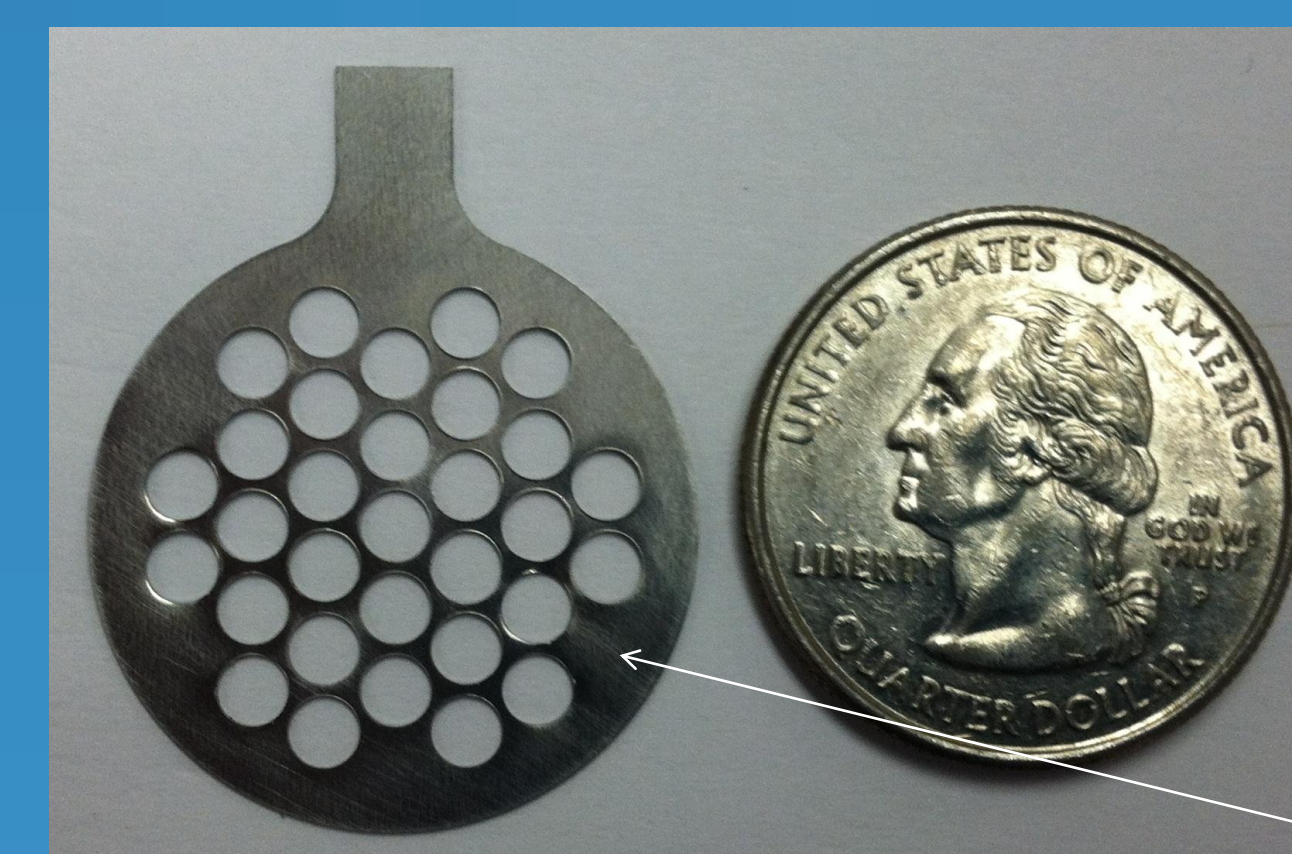
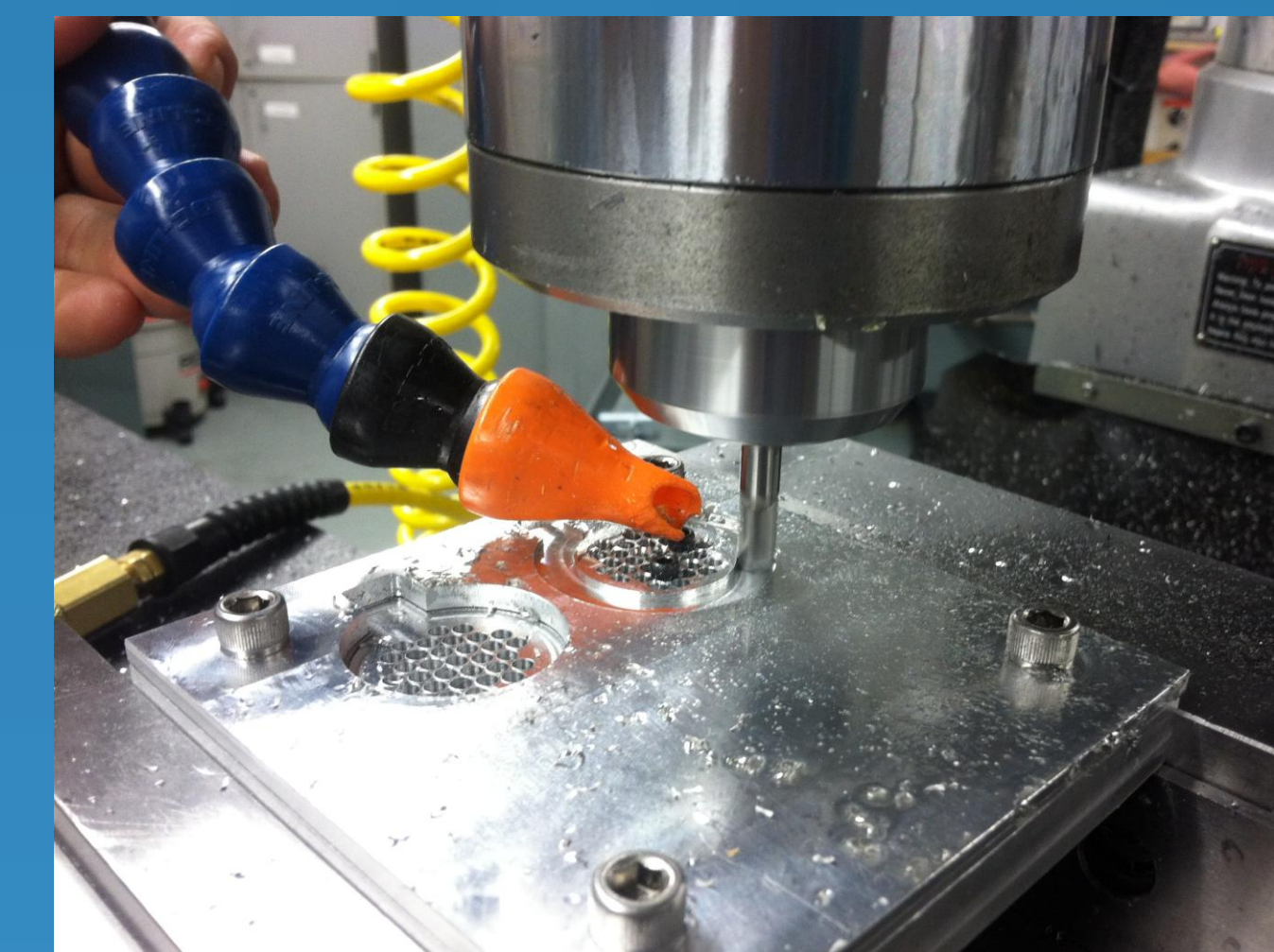
Mechanical Fabrication of Micro Grids

- SolidWorks drawing is created and transferred to the CNC milling machine



- Sacrificial top and base plates created to hold the stainless steel sheet in place while the grid is machined

- The grid is bolted to the sacrificial base plate while the perimeter is being machined



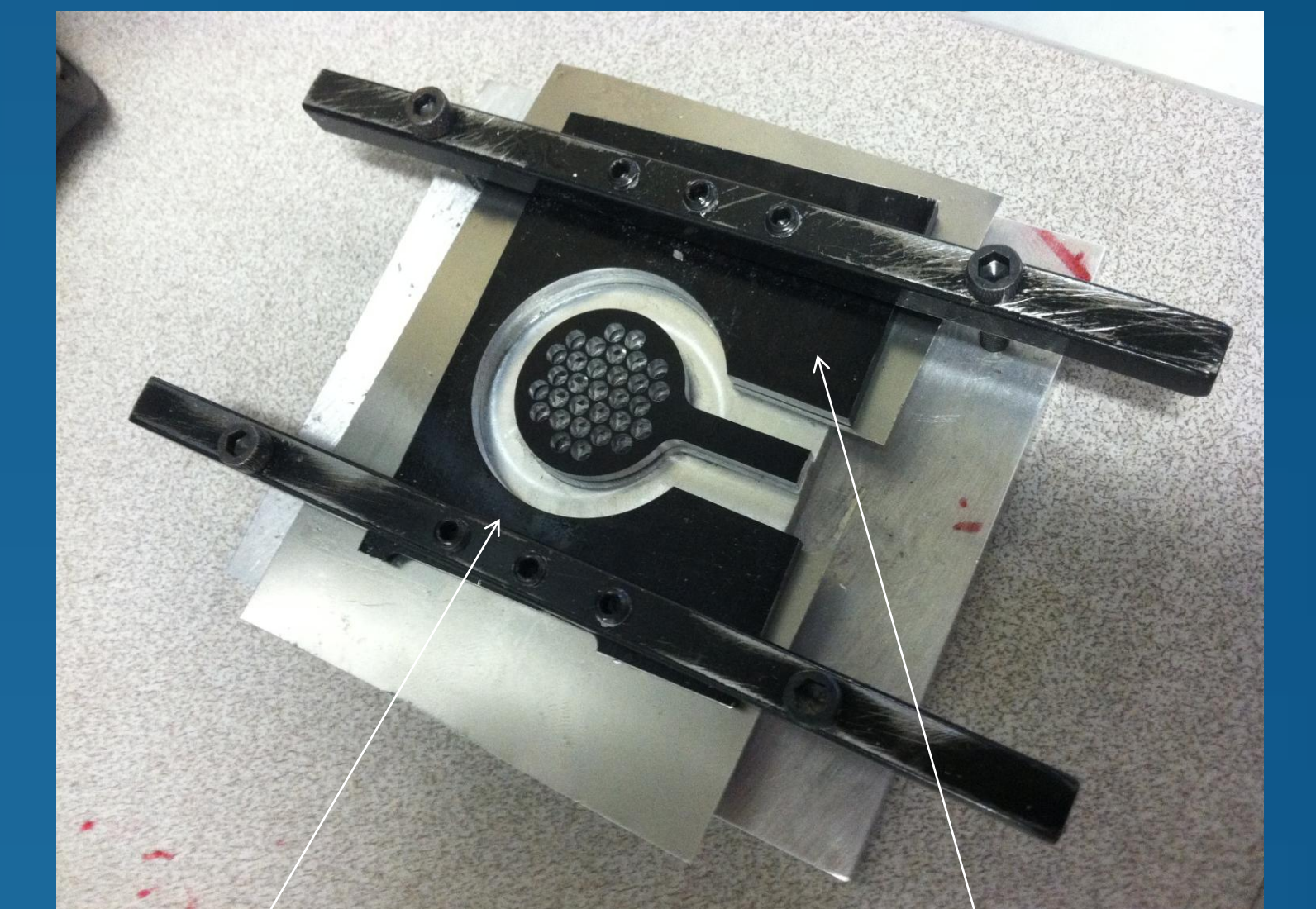
Shortcomings

- Stresses created in grid webbing
- Tabs too short

Stress in the grid webbing

Modifications

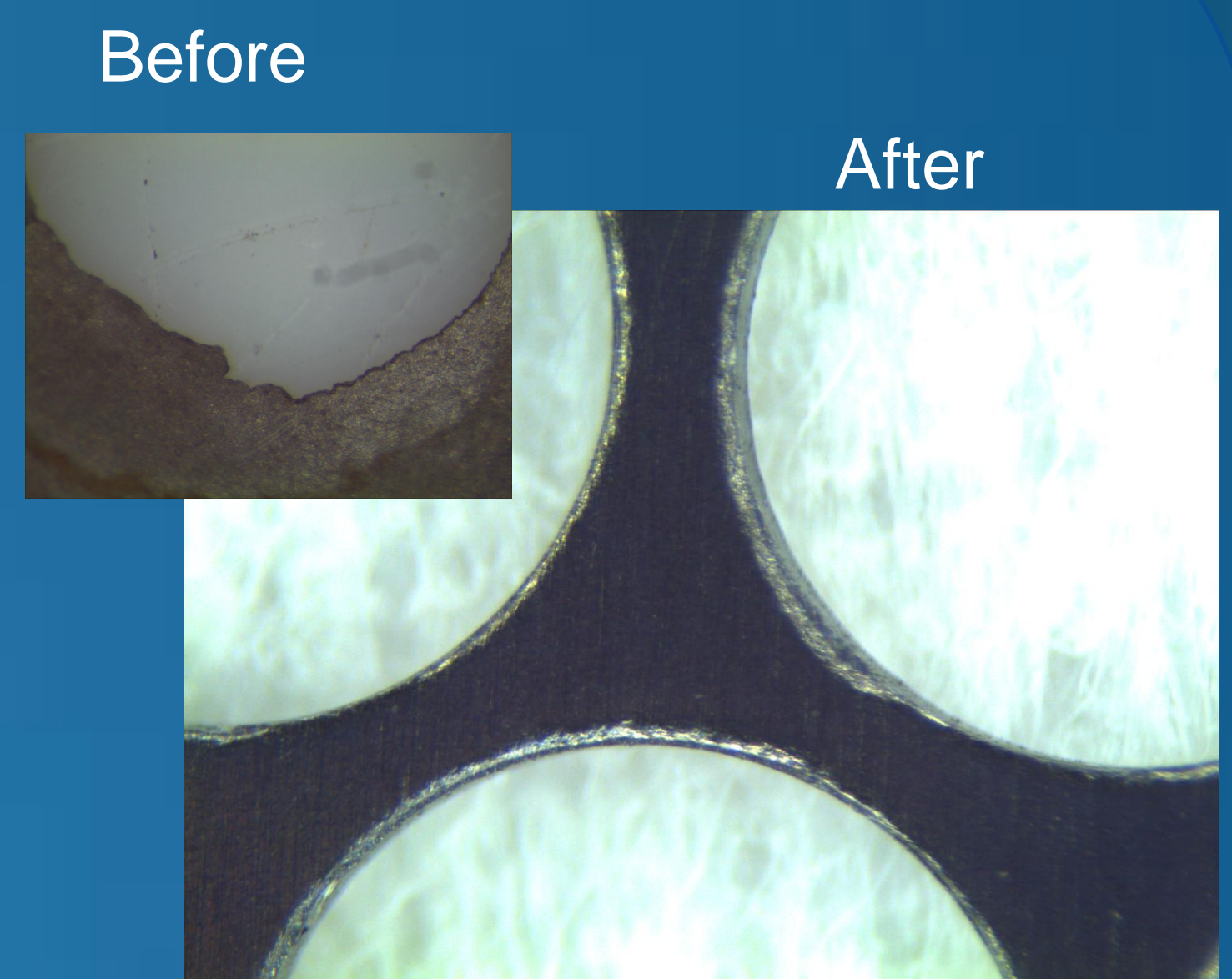
- New jig - no stresses in grid webbing
- Allowed for longer tabs
- Two sheets stainless steel milled together



Stainless steel sheets Lengthened tab

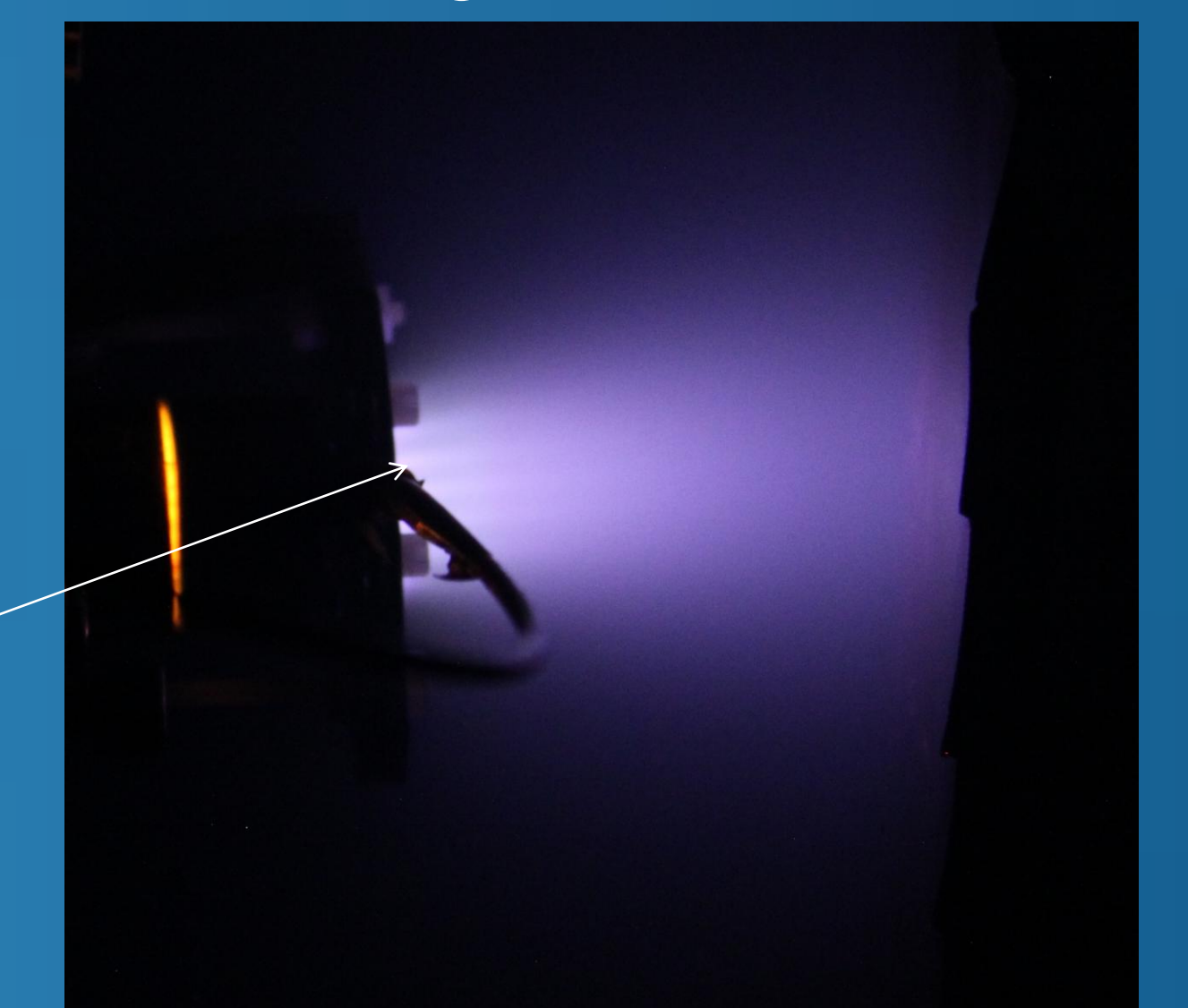
Results

- Finished grid hole fabricated through machining
- No stresses occurred on the grid webbing
- Clean round grid holes



Longer tab

- The grid with the longer tabs inserted in chamber for testing
- At pressures of 10^{-6} torr, no arcing occurred



BOISE STATE UNIVERSITY
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¹Mechanical and Biomedical Engineering Department, Boise State University

²Electrical and Computer Engineering Department, Boise State University

³Materials Science and Engineering Department, Boise State University

