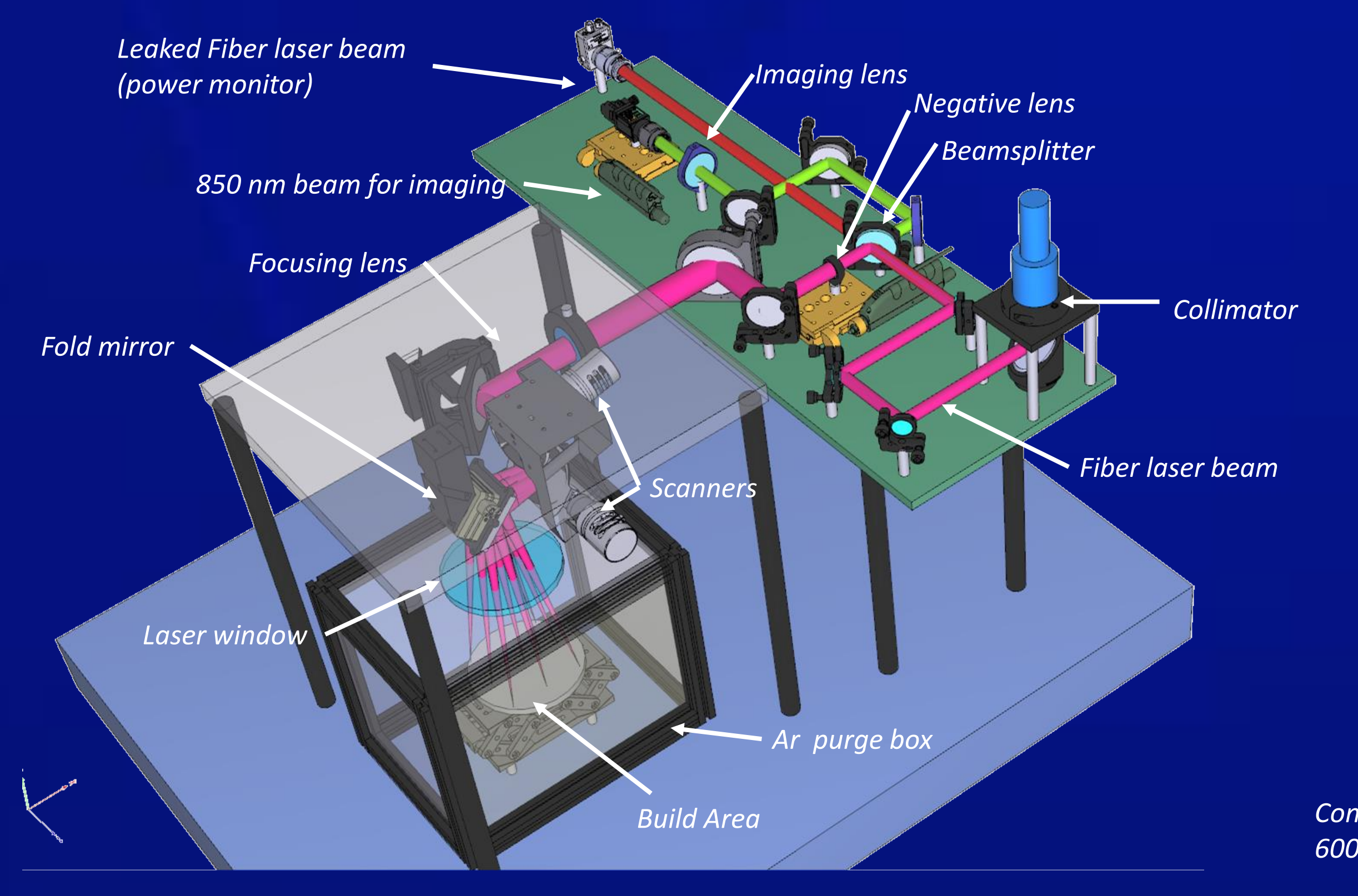


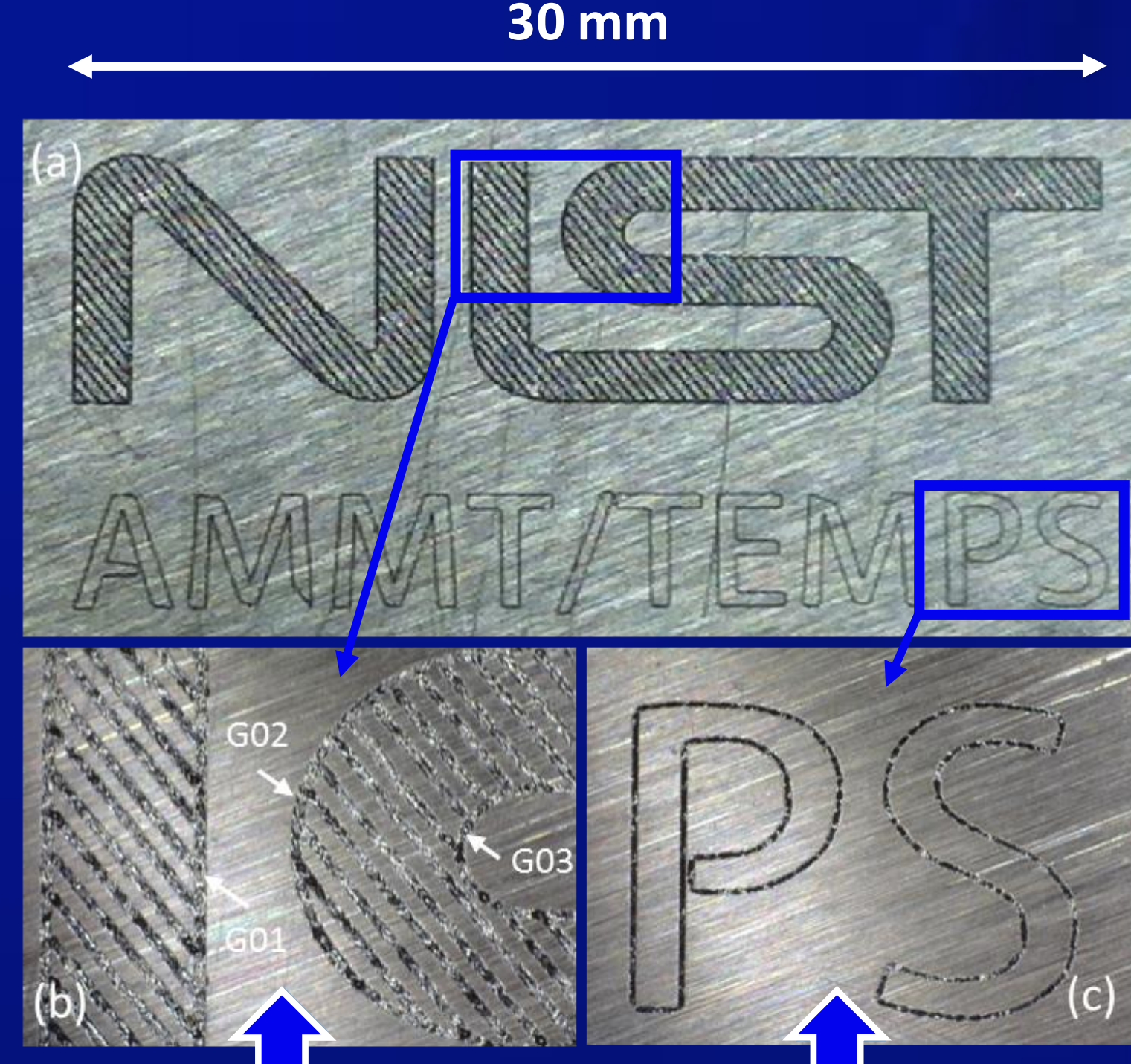
### Initial System Testing and Results

- PROTOTYPING SYSTEM**
- Initial testing of the laser, optical components, and programming of controller and user interface.
  - Evaluate stability of optics, sensitivity of sensors, laser beam profile, etc.



### LASER SCAN CONTROL with AM-G CODE

- Custom laser scan controller allows position, velocity, and power control at 100 kHz using xy2-100 protocol.
- Provides example of open-source control to promote LPBF controller standardization.

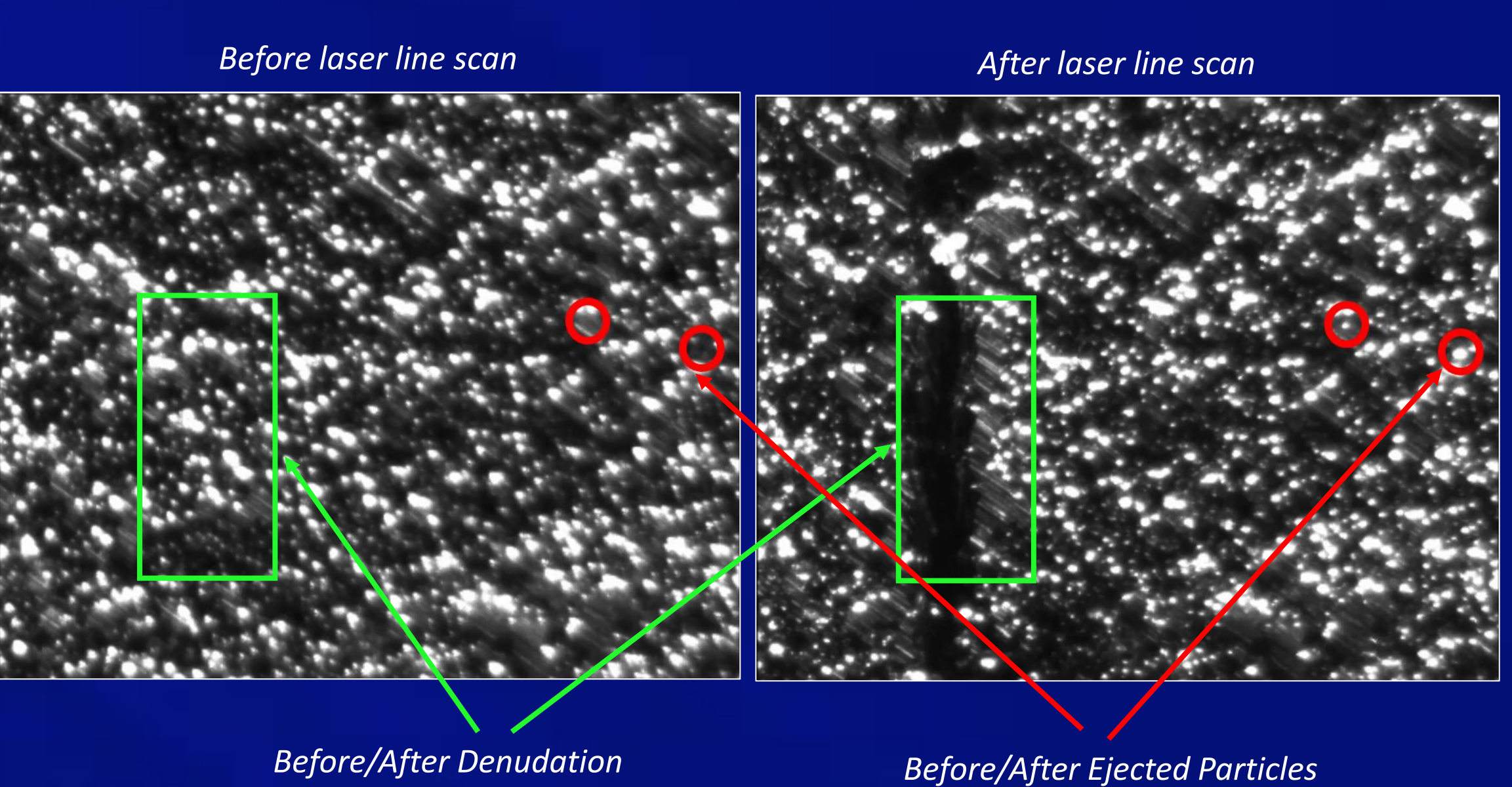


Constant build speed - constant density mode, 600 mm/s, 225 W maximum laser power

Continuous path - constant power mode, 200 mm/s, at 75 W laser power

### PART or POWDER SURFACE IMAGING

- In-situ layer-wise monitoring camera captures, measure, and quantifies surface geometry or irregularities.
- High magnification of powder layer enables study of phenomena such as denudation or particle ejecta.



Images taken before (left) and after (right) deposition of a scan line on a single 20  $\mu\text{m}$  layer of stainless steel powder, which show material ejection and denuding of powder highlighted in green and red, respectively.

### HIGH SPEED IMAGING of MELT POOL

- Initial testing of the co-axial cameras. Ultimately, these cameras will quantify melt pool size and intensity dynamics, enable research in melt pool feedback control, and potentially provide melt pool temperature values.

