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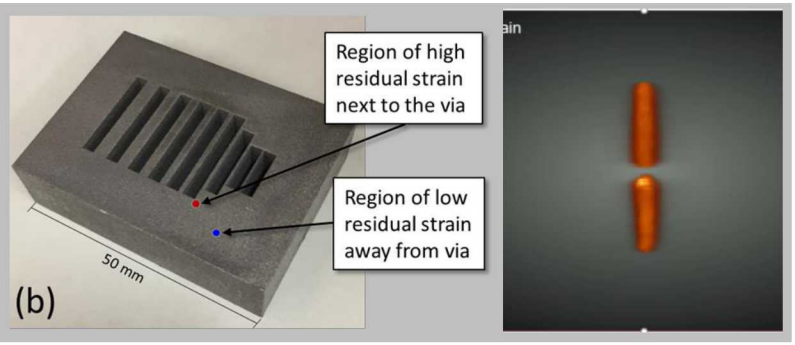

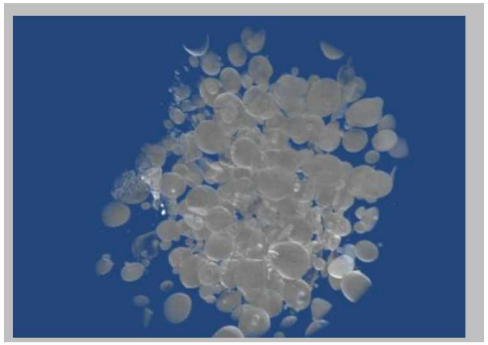

SV3D: From 3D Interrogation to 3D Collaboration

Mark A. Rodriguez, Jonathan Madison, Tod Amon, Aaron Comen, Timothy Dropps, Thomas Ivanoff, and John J. Jones

U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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Our Enhanced Surveillance Project Goal

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Develop an **Intuitive and Immersive Diagnostic** for μ-CT and other 3D datasets to improve the speed and efficiency by which these massive files are explored and evaluated.

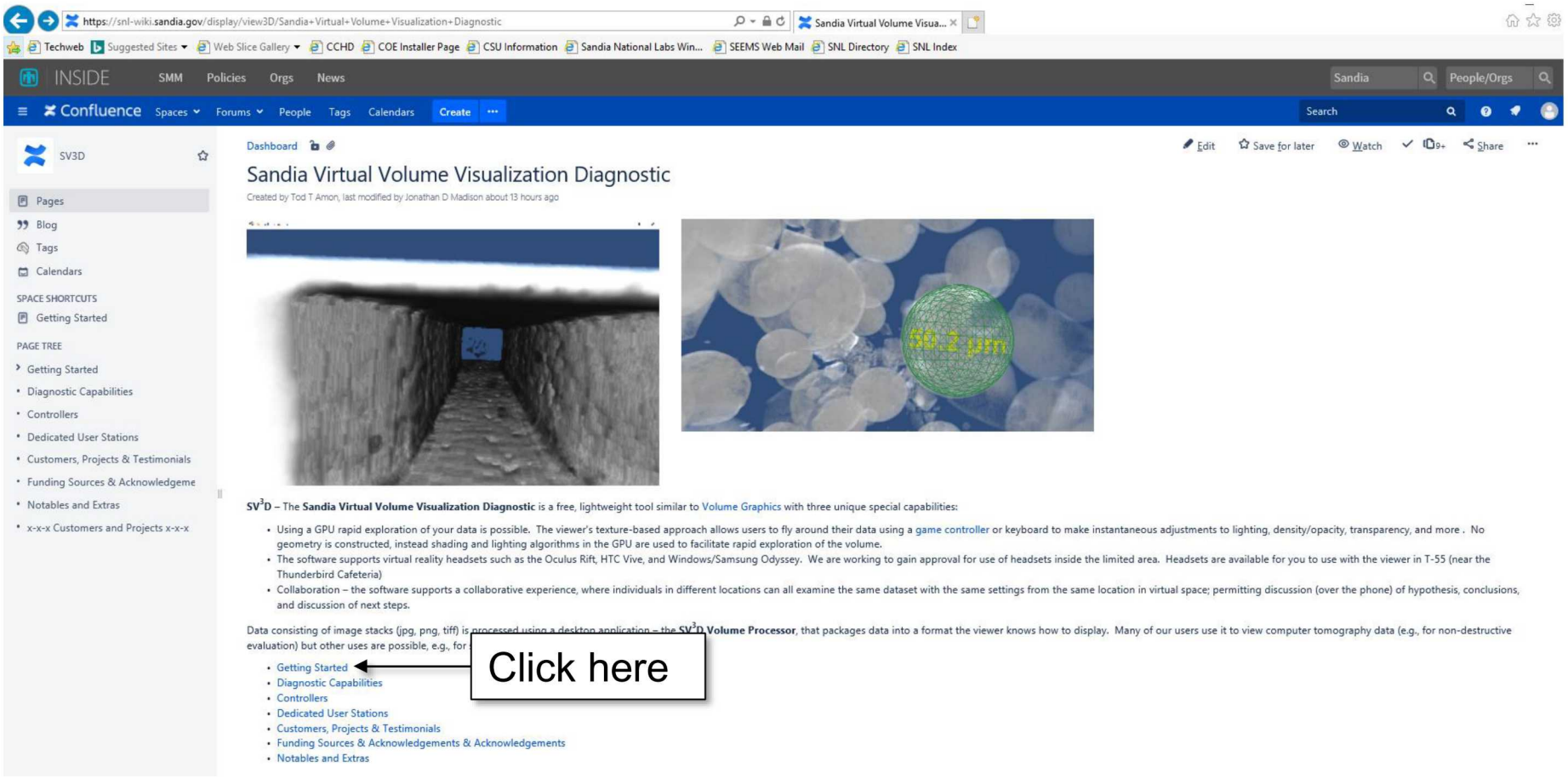
We employ a **Virtual Reality** environment and powerful **GPUs** to realize this goal

It's Free!

It is currently available to Sandians via our Wiki site on the SRN!

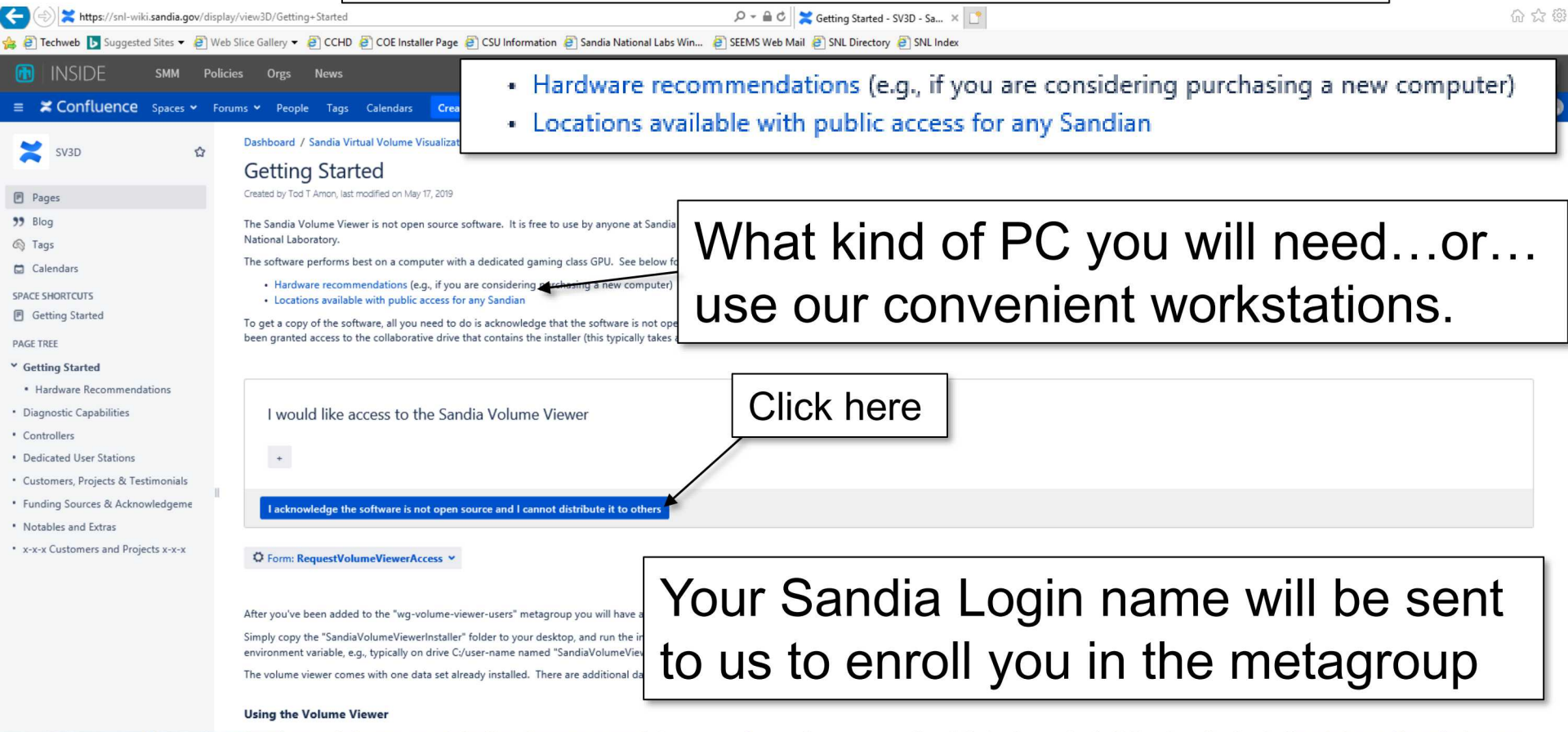
We have a Wiki link to our site

https://snl-wiki.sandia.gov/display/view3D/Sandia+Virtual+Volume+Visualization+Diagnostic



How would I get started?

https://snl-wiki.sandia.gov/display/view3D/Getting+Started



- Hardware recommendations (e.g., if you are considering purchasing a new computer)
- Locations available with public access for any Sandian

What kind of PC you will need…or… use our convenient workstations.

Click here

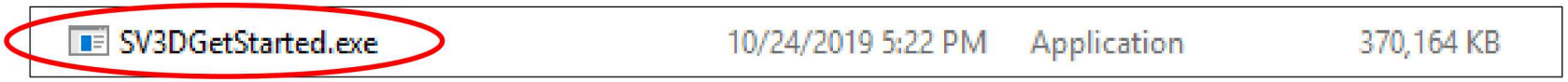
Your Sandia Login name will be sent to us to enroll you in the metagroup

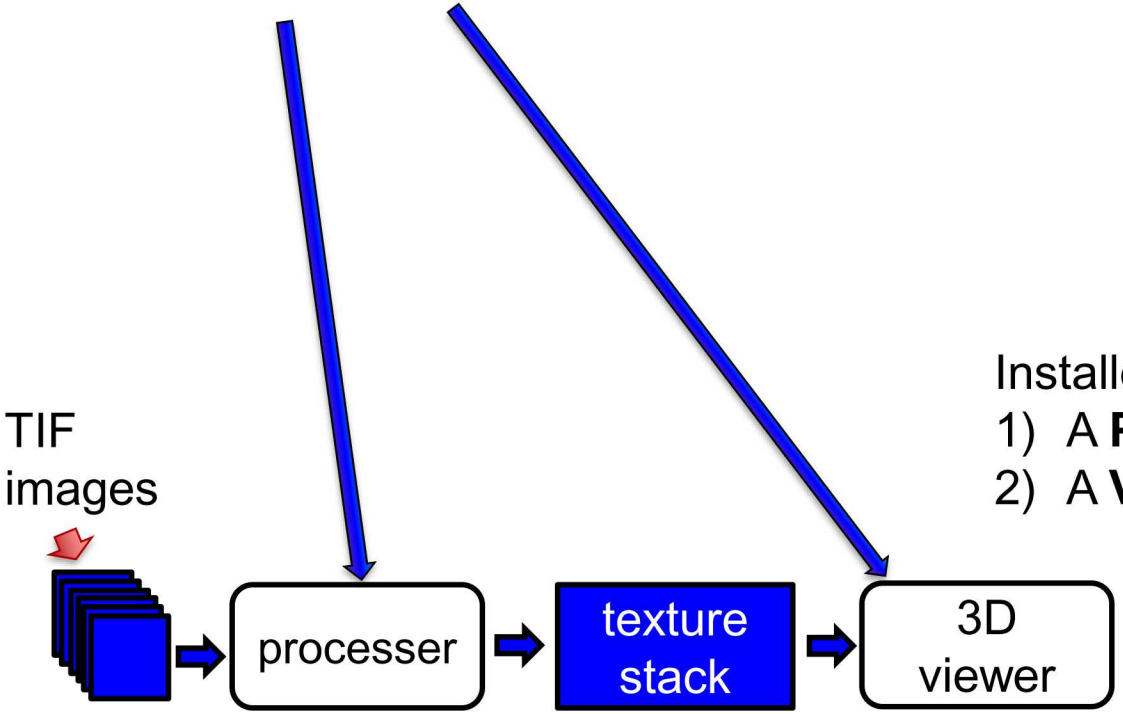
We can provide you with a game controller too!

You need two programs to get going.

\\snl\collaborative\view3D

\\snl\collaborative\view3D\sv3Dinstall





Installer will provide two programs:

1) A **Processer**
2) A **Viewer**

Where are your fast PCs to view my data?

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Dashboard / Sandia Virtual Volume Visualization Diagnostic

Dedicated User Stations

Created by Tod T Amon, last modified by Jonathan D Madison yesterday at 10:44 PM

In addition to downloading SV^{3}D for use on your own workstation, if desired, personnel may use one of c
purpose of visualizing 3D data within the diagnostic. If downloading the diagnostic is your preferred rout

Building 701, Room 1207 – (s# - ***this is your best option for very large datasets****

- OMEN X 290 PC; 512SSD; 3TB Hybrid Drive, 22GB RAM; GEFORCE RTX 2080 Ti Graphics Card
- Windows 10 Home
- HP Business Z32 31.5" LCD Monitor
- (1) HP standard keyboard
- (1) Dell scrolling mouse
- (1) Xbox One Controller Model 1708 (approved for use inside LTA)
- primary contact: Jonathan Madison (Org. 1851)

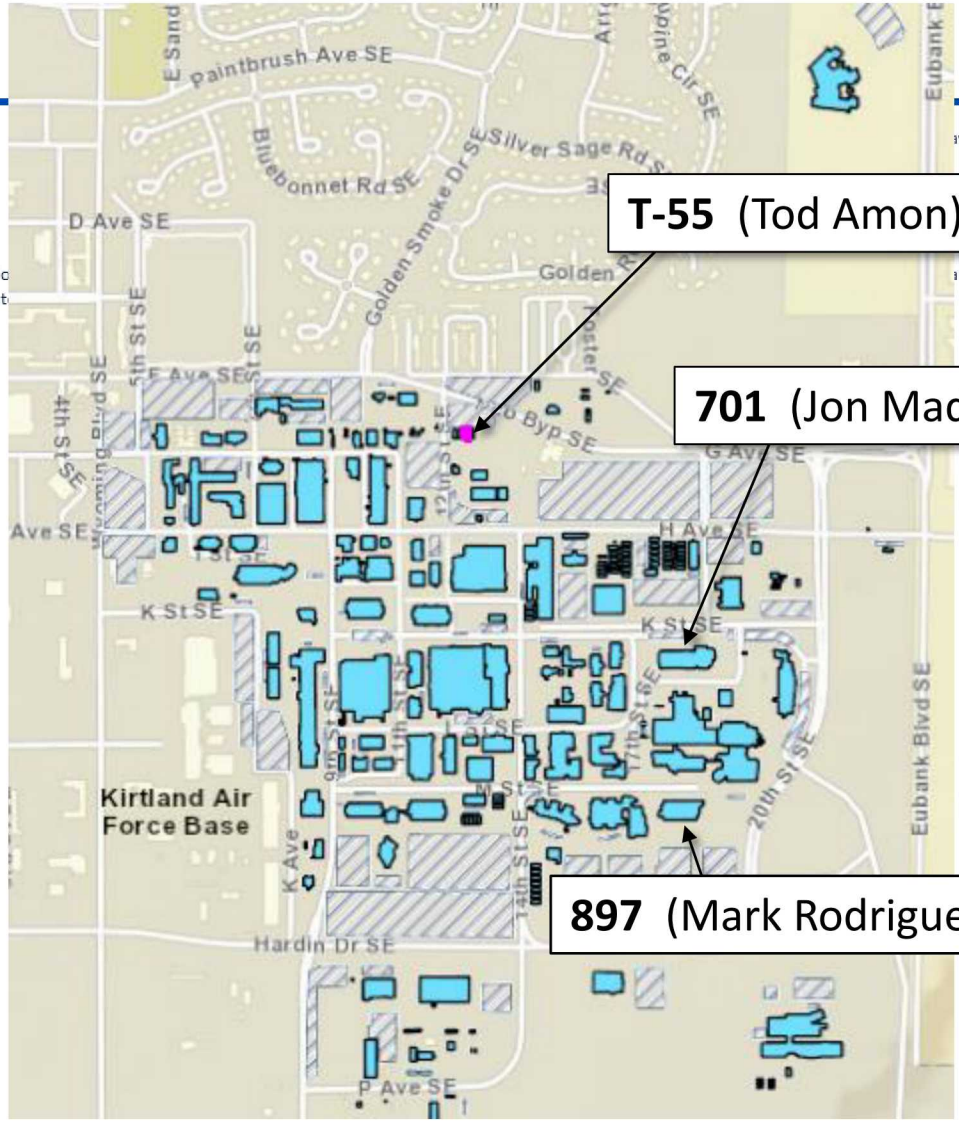
Building T55, Room 1 – (s#)

- Desktop PC, 2 mobile laptops, all with 1080 Graphics Card
- Windows 10 Home
- Specify Monitor Type here.....
- (1) HP standard keyboard
- (1) Dell scrolling mouse
- (1) Xbox One Controller Model 1708 (approved for use inside LTA)
- primary contact: Tod Amon (Org. 9368)

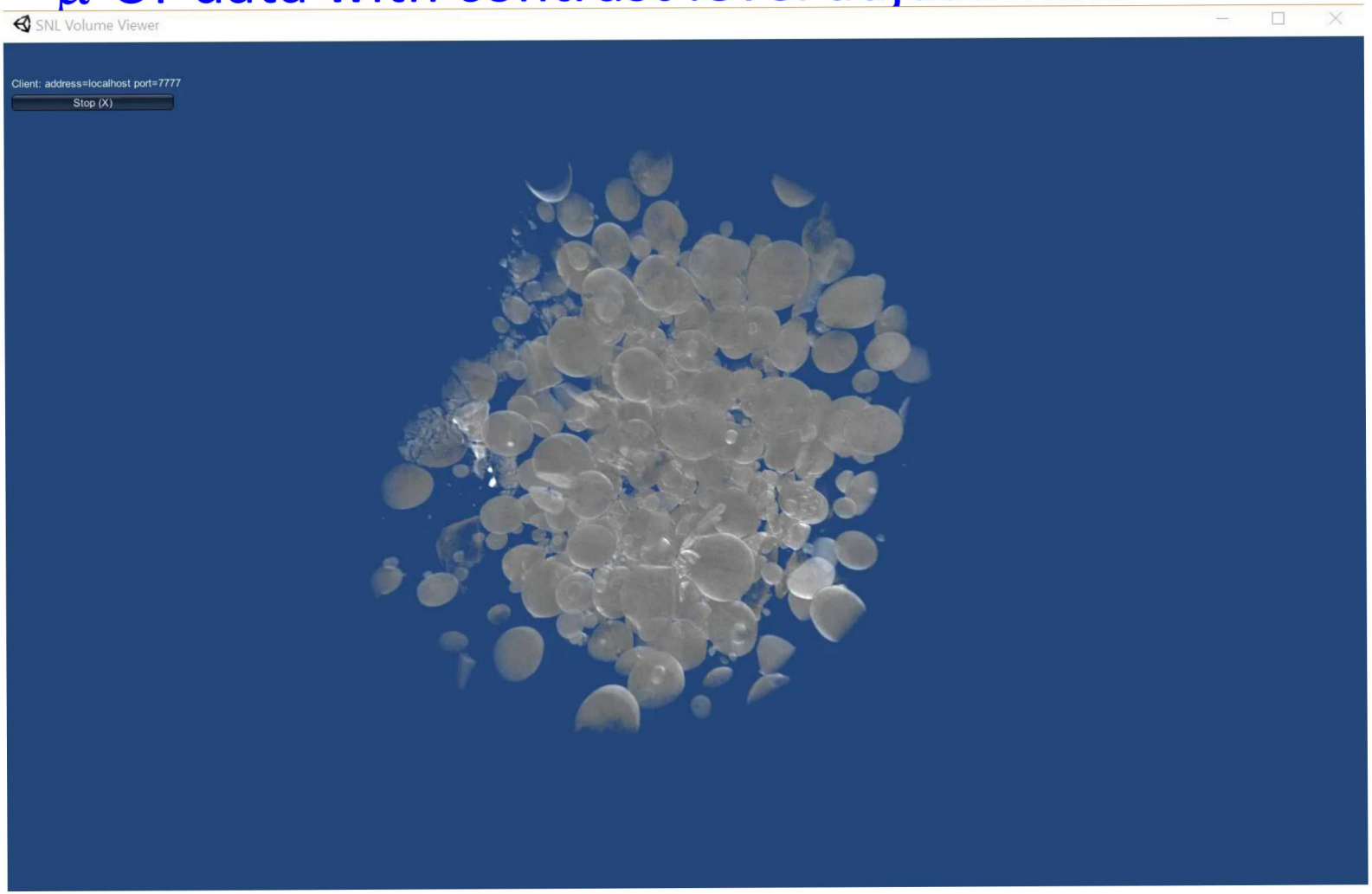
Building 897, Room 2475 – (s#)

- Desktop PC, with 1080 Graphics Card
- Windows 10 Home
- Specify Monitor Type here.....
- (1) HP standard keyboard
- (1) Dell scrolling mouse
- (1) Xbox One Controller Model 1708 (approved for use inside LTA)
- primary contact: Mark Rodriguez (Org. 1819)

Like Jonathan D Madison likes this



Glass beads in Epoxy: fly-through video of μ-CT data with contrast level adjustment



Collaborative Viewing over the Network

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We have looked at other times of multi-dimensional data using Virtual Reality

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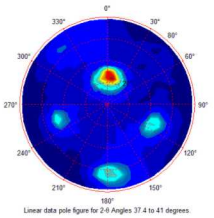
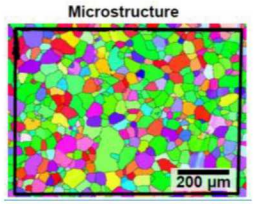
- X-ray Diffraction (XRD) is used for characterizing material structure and composition.
- XRD often is employed to measure the degree or polycrystalline orientation (via pole figures)
- XRD can ***also detect*** residual strain in materials
  - residual strains, resulting from materials processing can result in failure modes
- Pole figure data is multidimensional and sometimes hard to visualize
- <u>Why not use VR to look at pole figure data to try and detect strain visually</u>?



courtesy
Jay Carroll



We have diagnosed residual strain in XRD datasets via distortion of intensity distribution in pole figures

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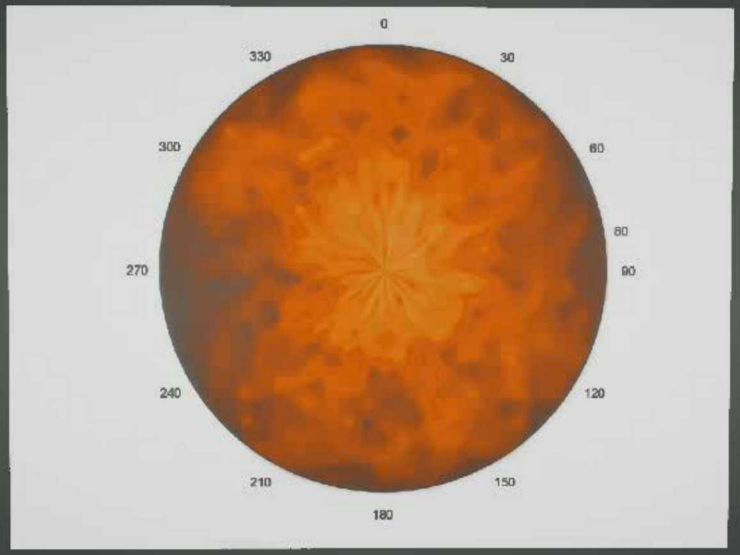
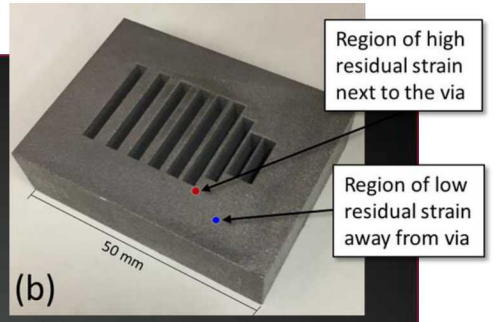
- high residual strain





video created in Dragonfly software

Unstrained region in AM part shows uniform intensity distribution in pole figure

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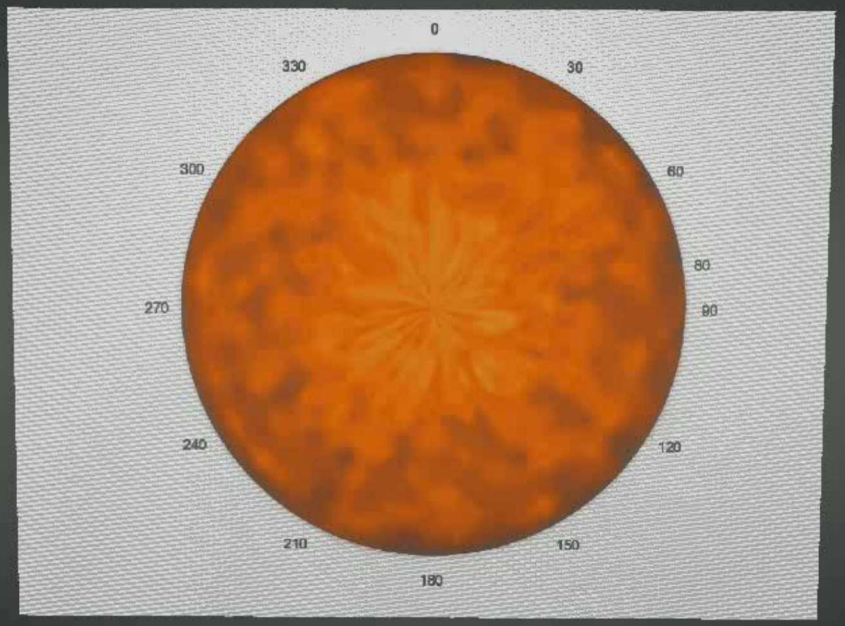
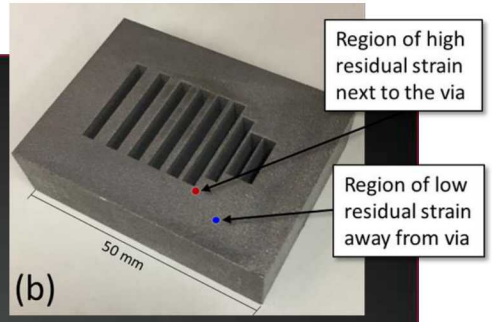
- Low residual strain





Summary

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- Virtual Reality visualization allows for fast and flexible diagnosis in an immersive 3D environment.
- Tool is available now (help us test it!).
- Visualization can be performed on-screen or with VR headset.
- Works in Tech Area (buildings T-55, 701, 897, more to come).
- VR tools and options are available for data manipulation, marking, and measurement.
- Software is network capable for collaborative and interactive viewing via the internet.
- Generic TIFF stack format translates easily for viewing 3D data from additional diagnostics.
- Project plans for FY20 include collaborative viewing via SCN network.

Acknowledgments

- A special thanks to James Griego for creating the XRD videos.
- Thanks to student interns Devon Oberdan and Bao-Loc Trinh for demonstrating the collaborative VR experience.
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