



Understanding localised measurement confidence in X-ray CT

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Outline

- Aletheia Imaging Solutions
- Image quality factors in radiography and X-ray CT
- Localised 3D volume spatial resolution maps
- Applying localised information
- Industrial Market Trial: AM powder NDE

2018 Renault F1 Conference – The beginning!



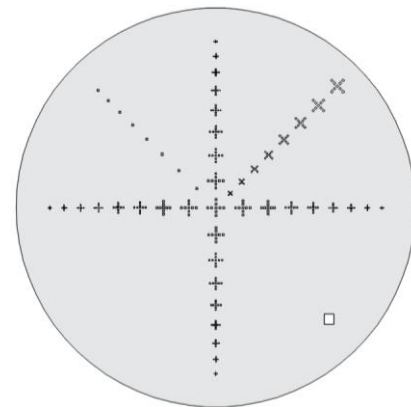
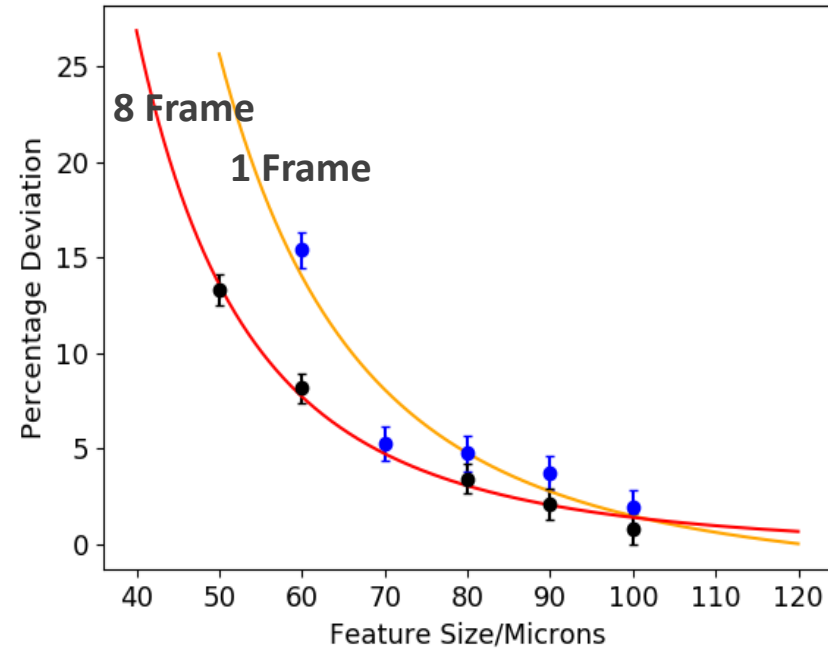
Aletheia Imaging Solutions

Design & build X-ray CT spatial targets (IQI/RQI) based on the fundamental physics

- Nyquist Shannon theory
- Beer Lambert law

Optimising X-ray CT parameters:

- Accurate spatial resolution evaluation measurement confidence
- Ensuring data consistency
- Minimising scan time – saving businesses **time** and **money**



Patent Pending (2103323.8)

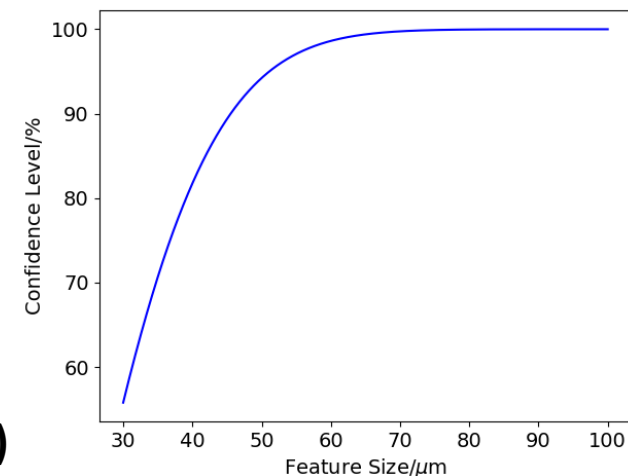
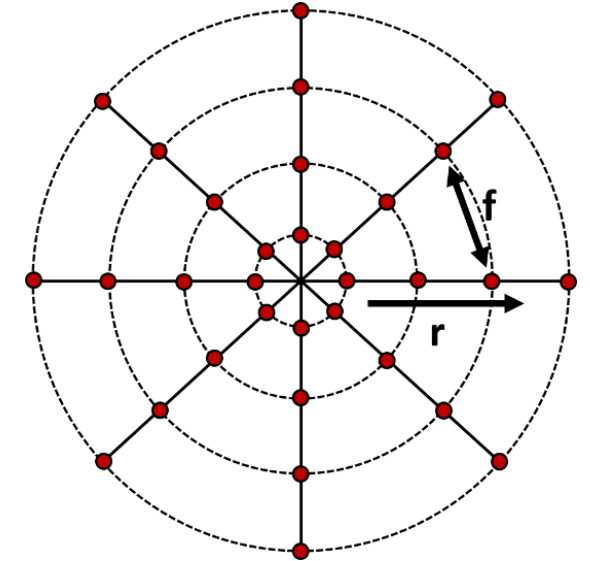
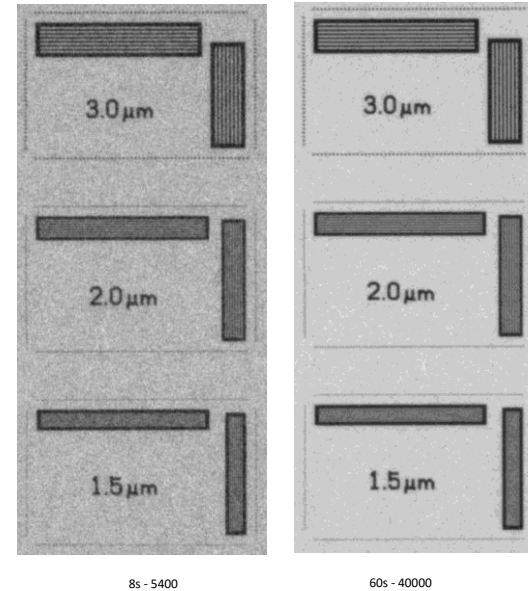


Image quality factors

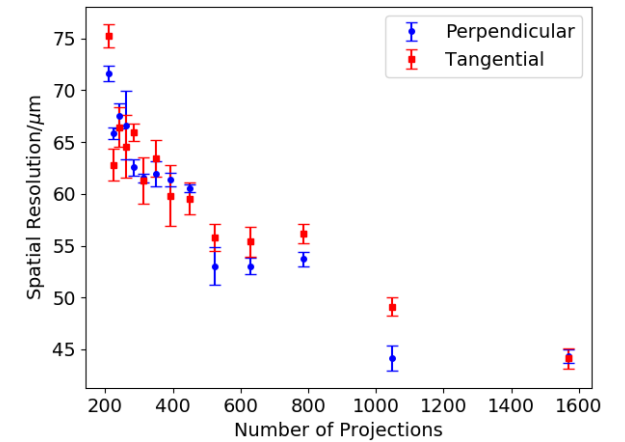
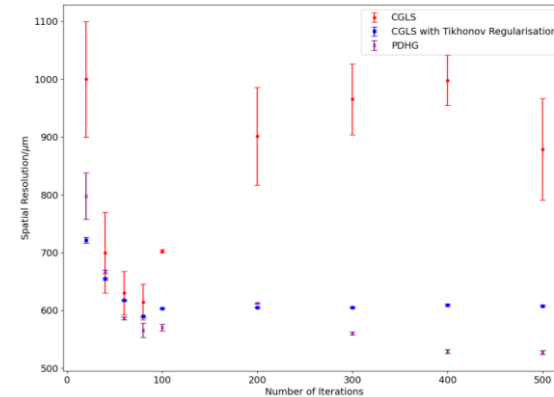
Spatial resolution in radiography:

- Pixel size (lower limit)
- Image noise
- Feature contrast
- *Focal spot blurring!*

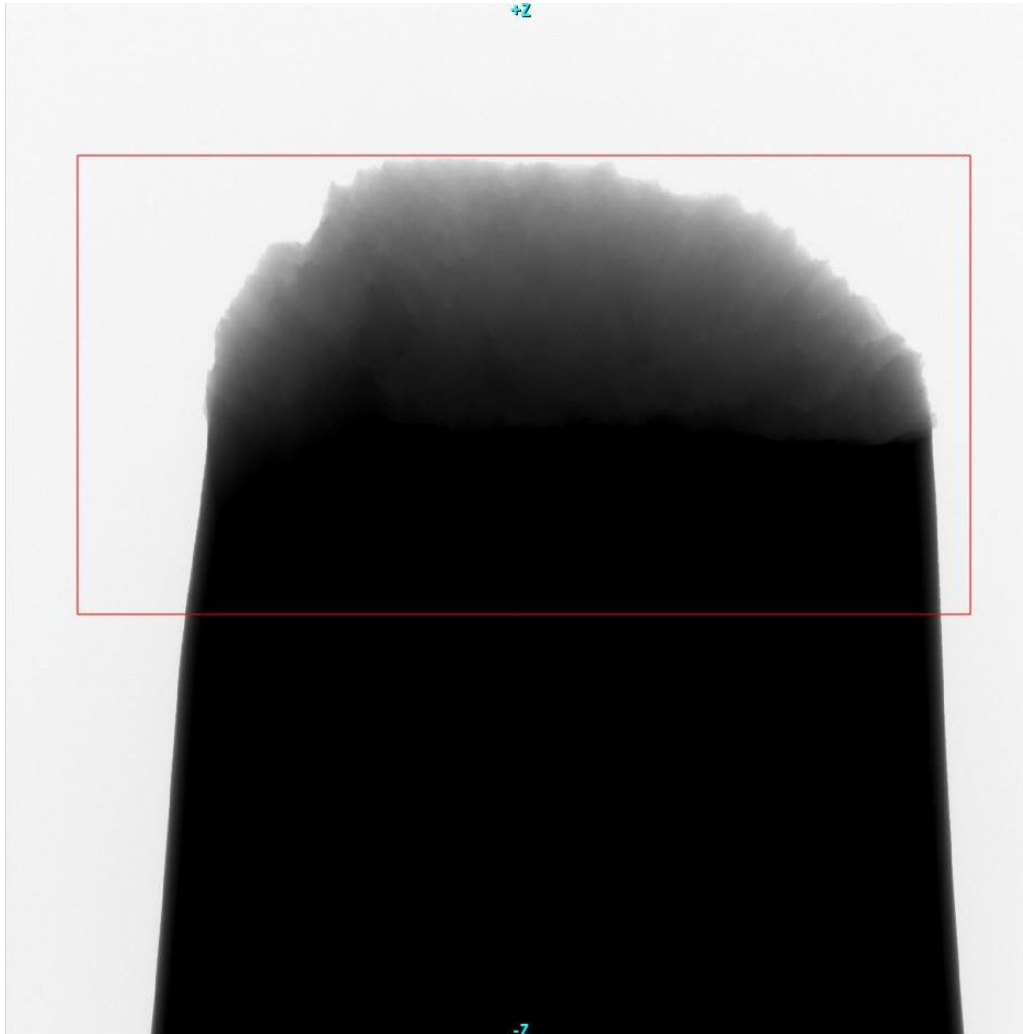


Spatial resolution in X-ray CT:

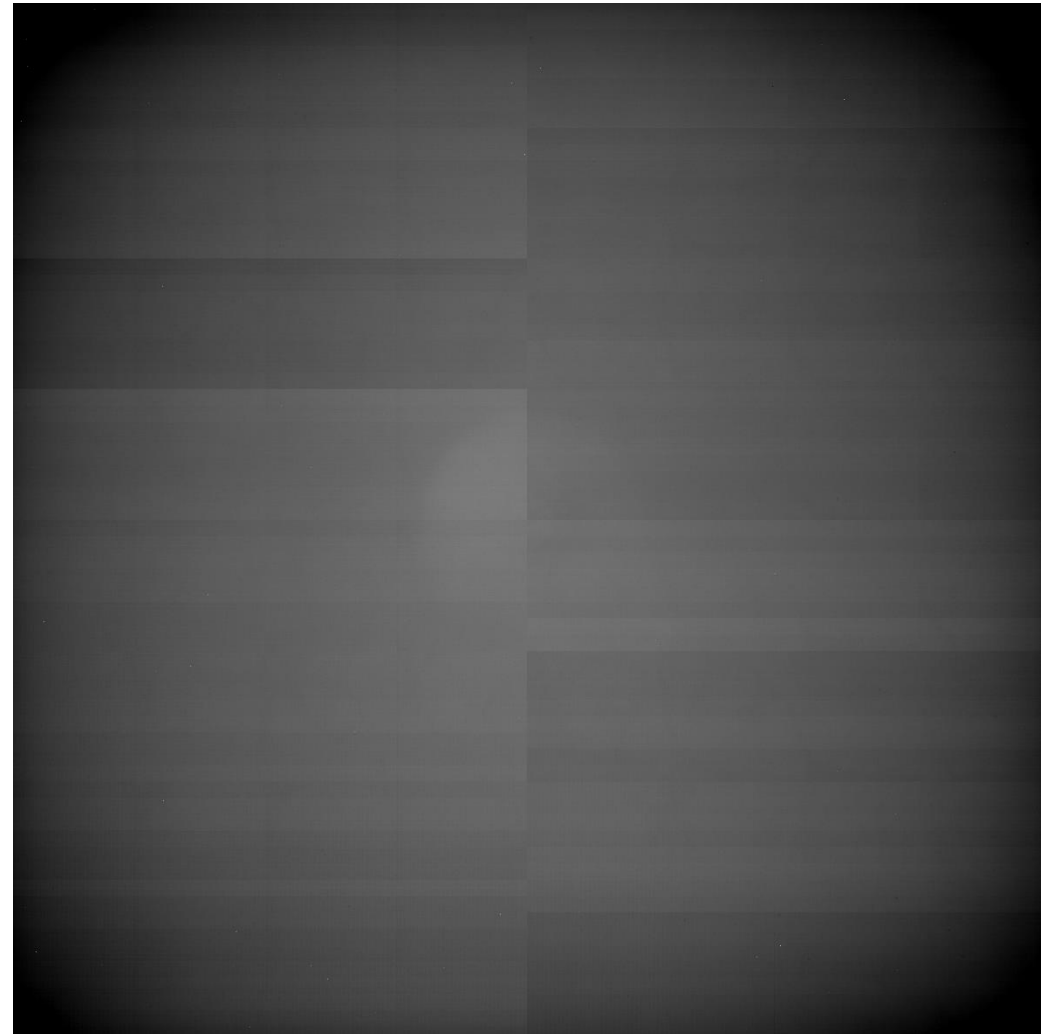
- Radiographic quality
- Number of projections
- The reconstruction code



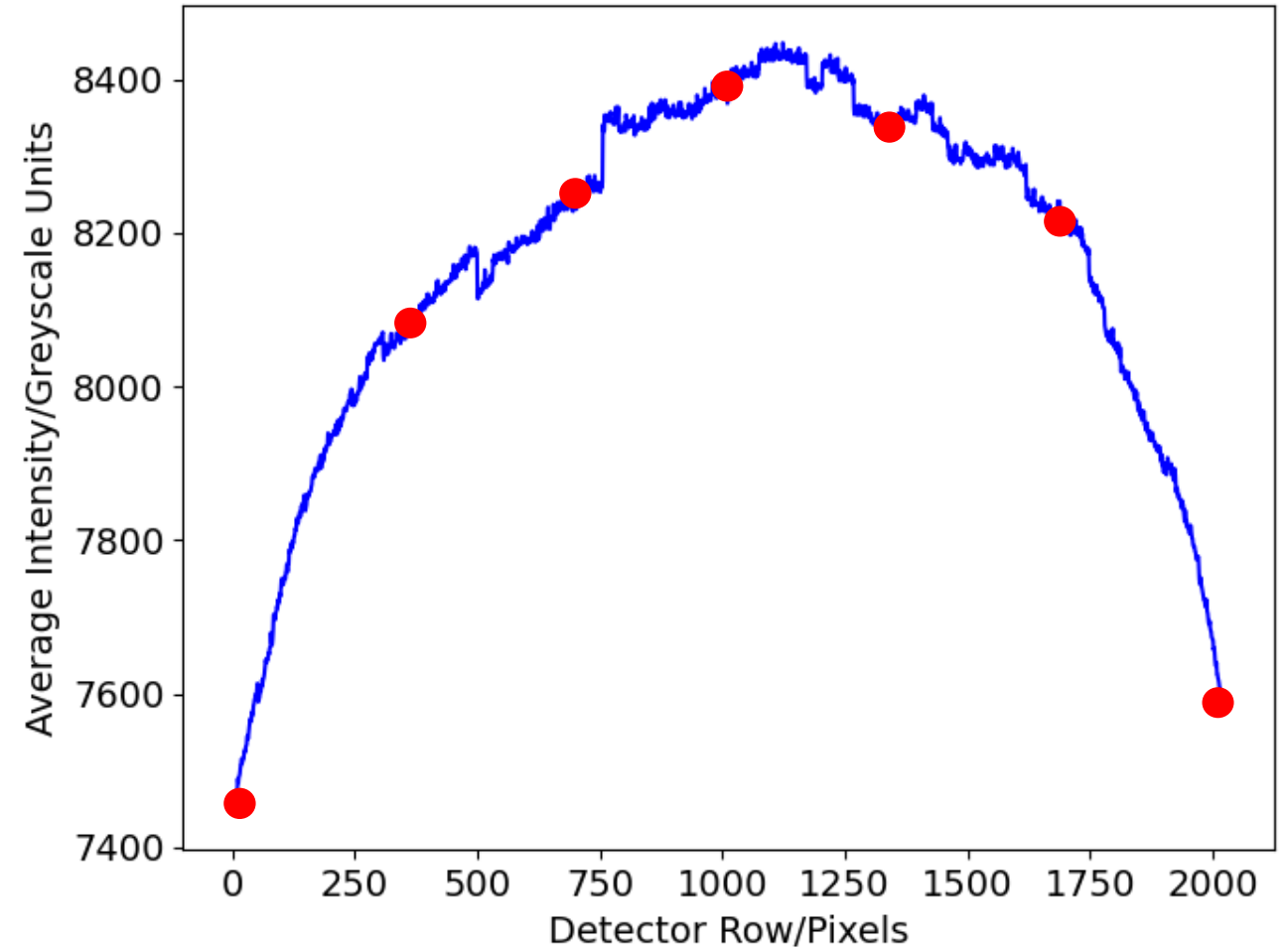
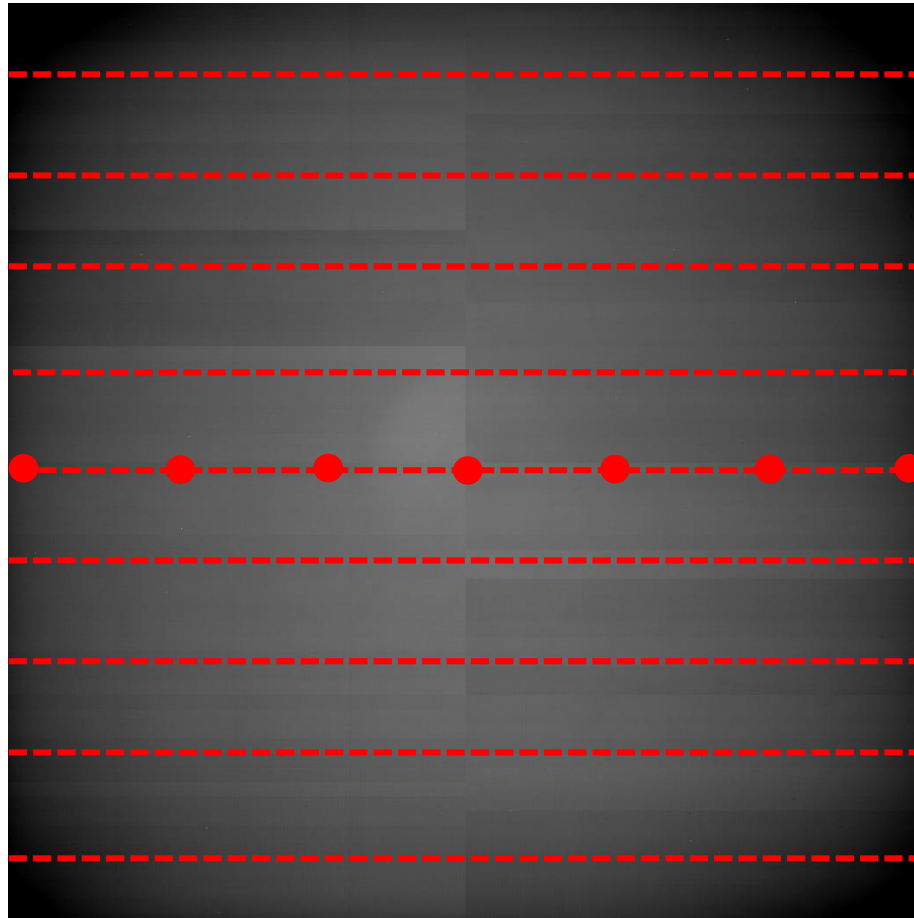
The problem of visual inspection



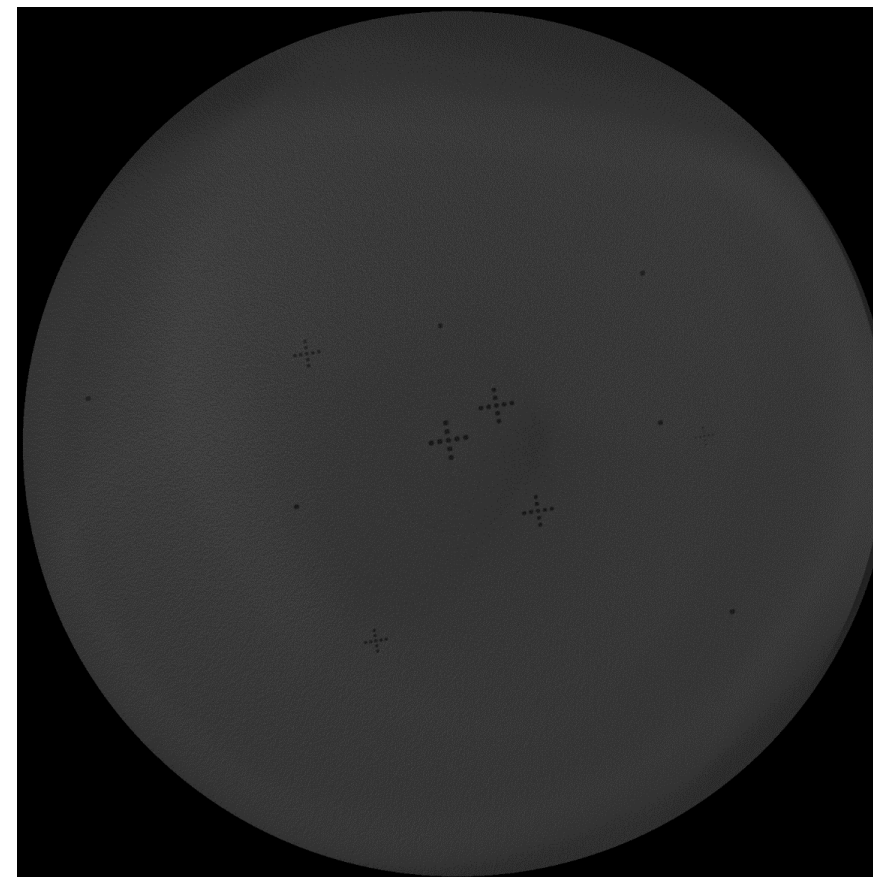
Radiograph with corrections



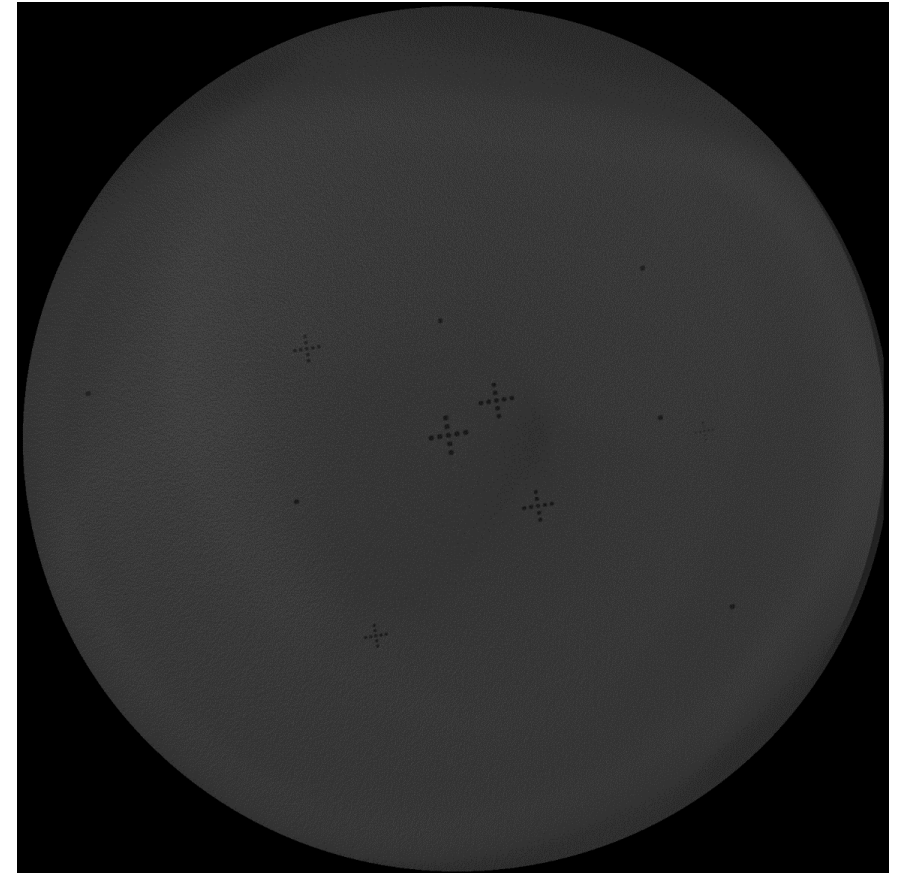
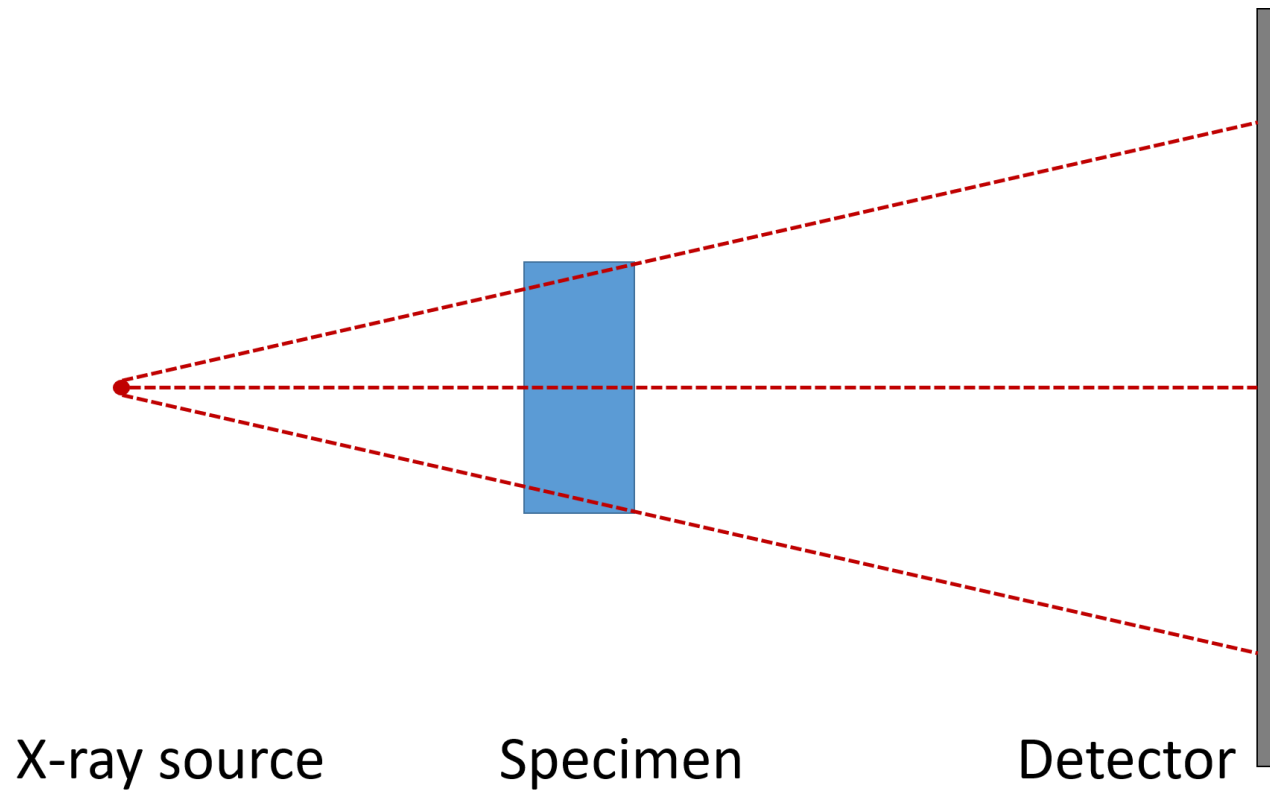
Uncorrected background image



RQI setup

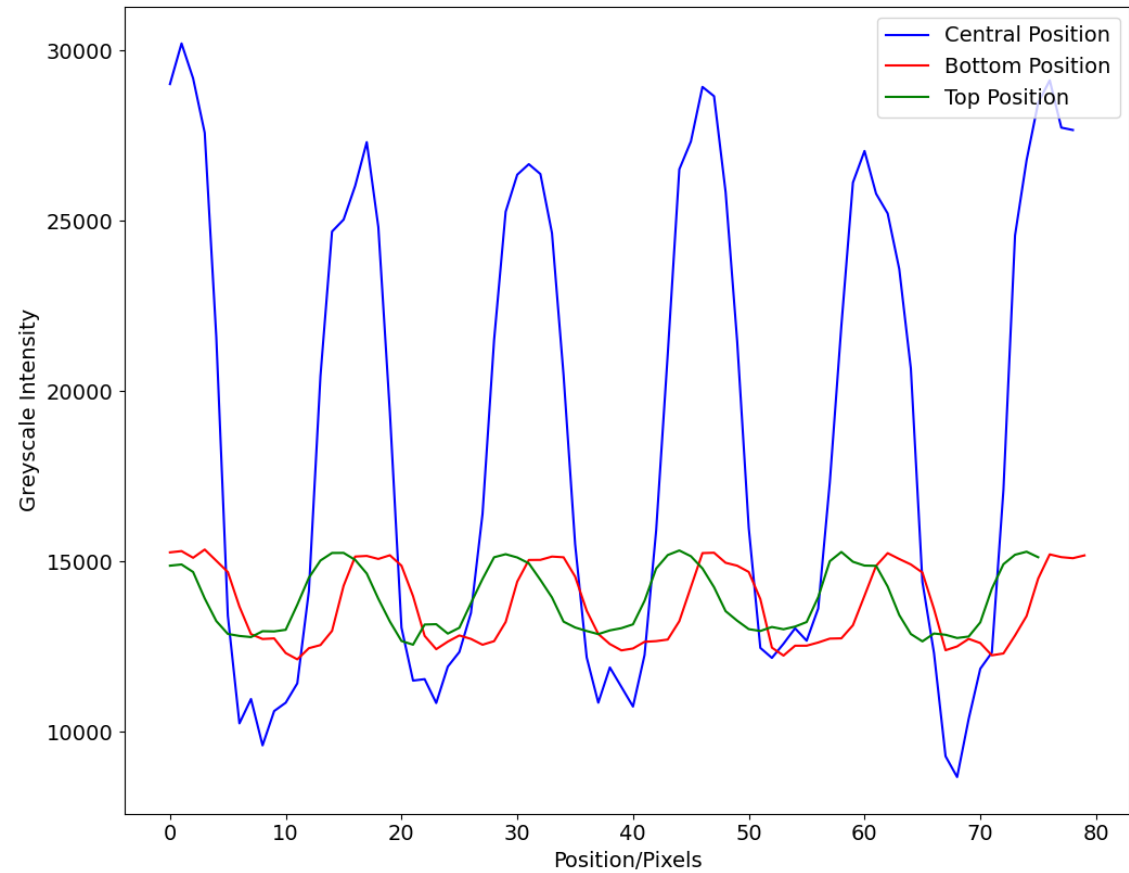
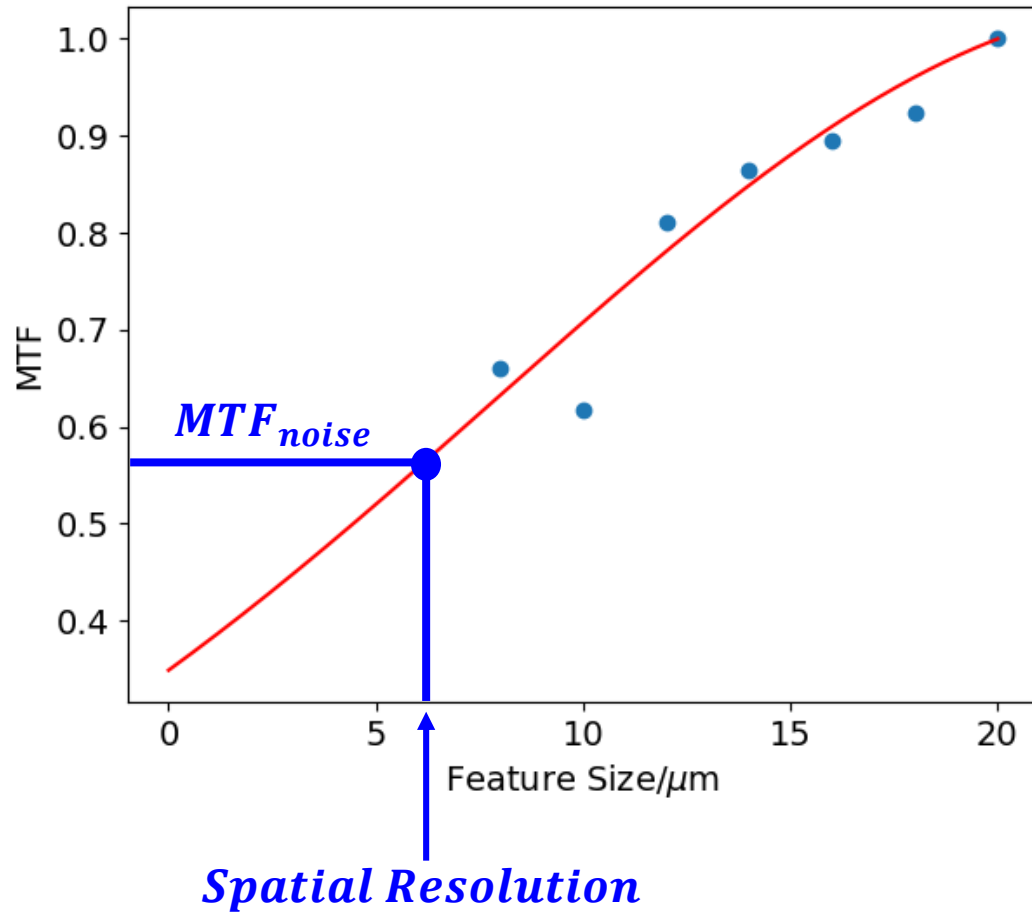


RQI setup

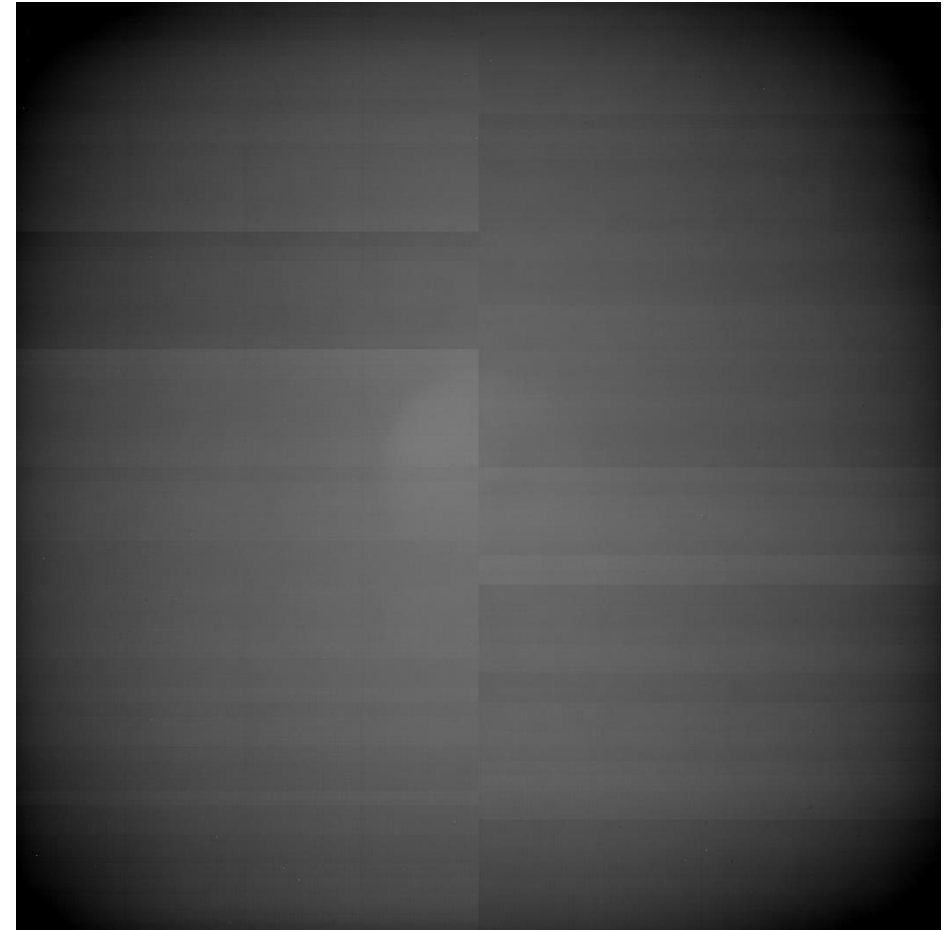
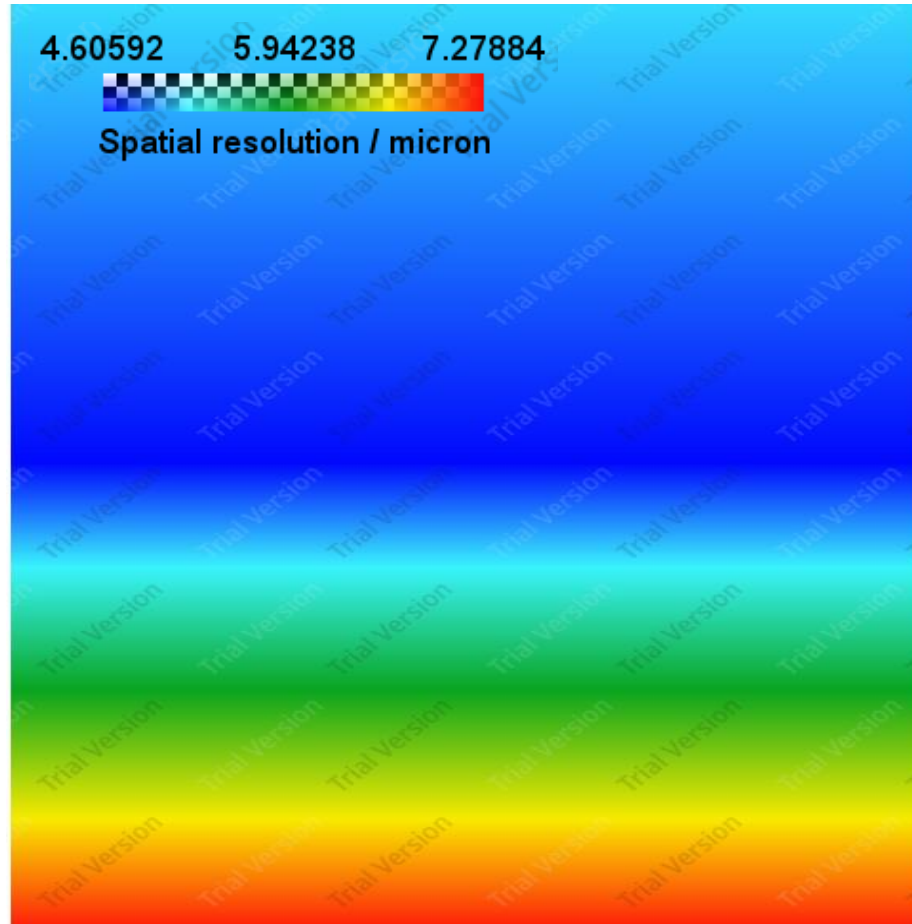


Aletheia Spatial target Patent Pending (2103323.8)

Measuring reconstructed spatial resolution

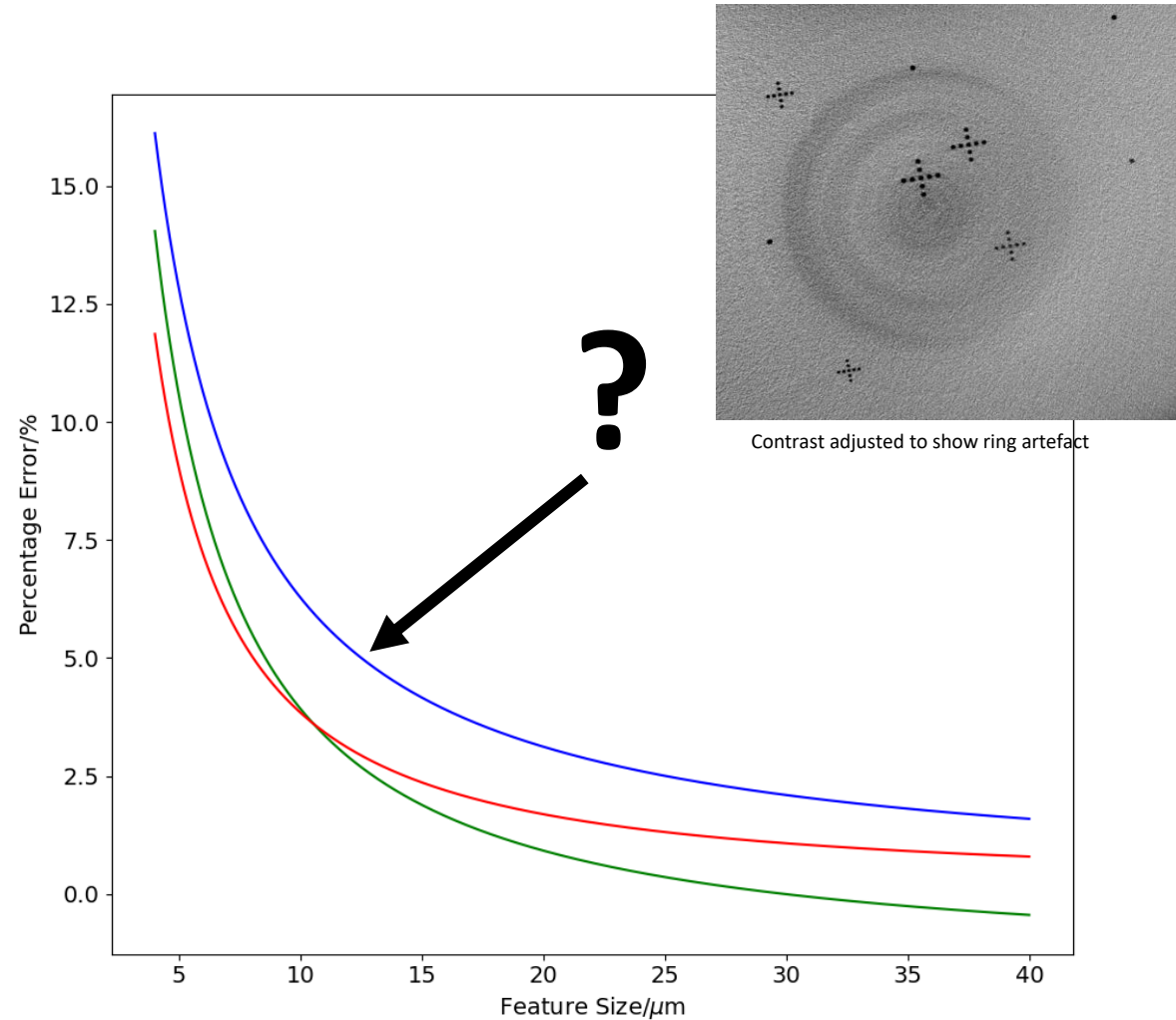
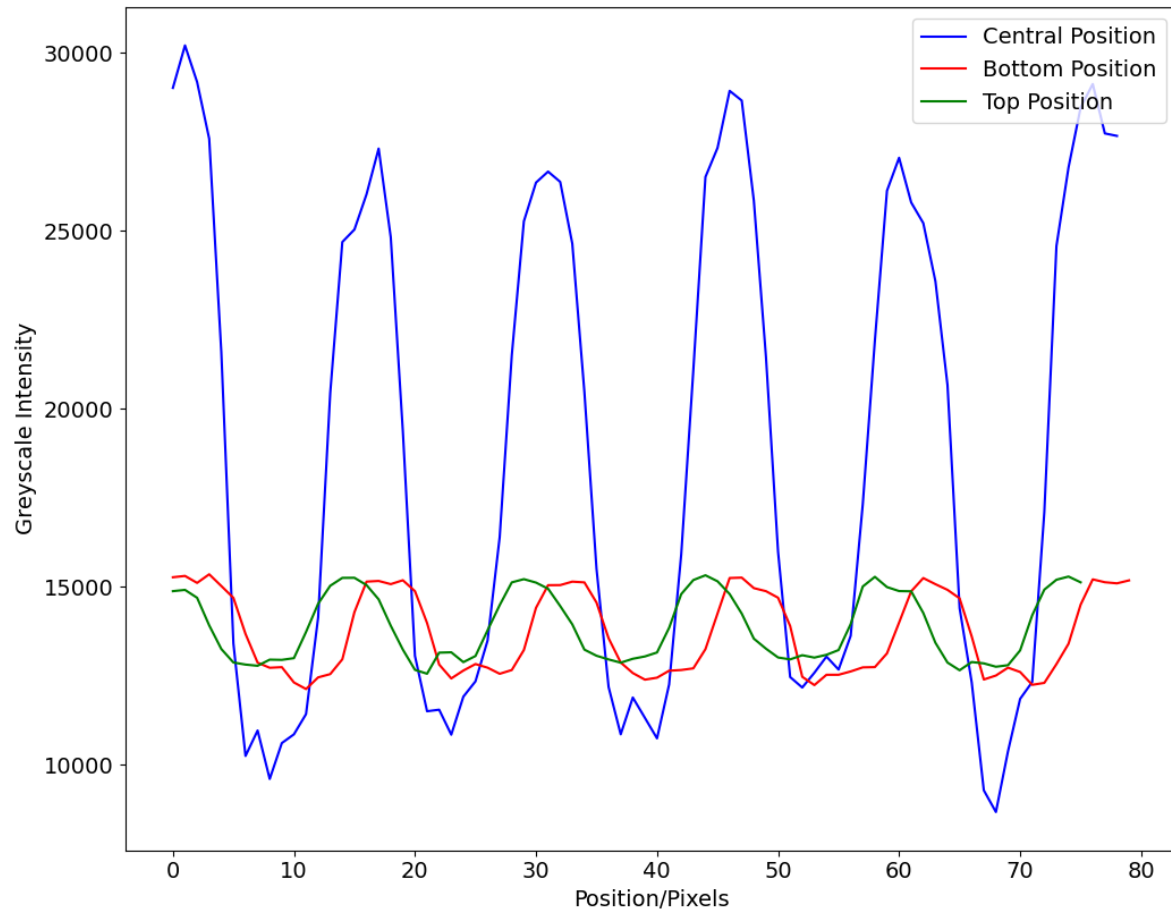


localised 3D volume spatial resolution maps



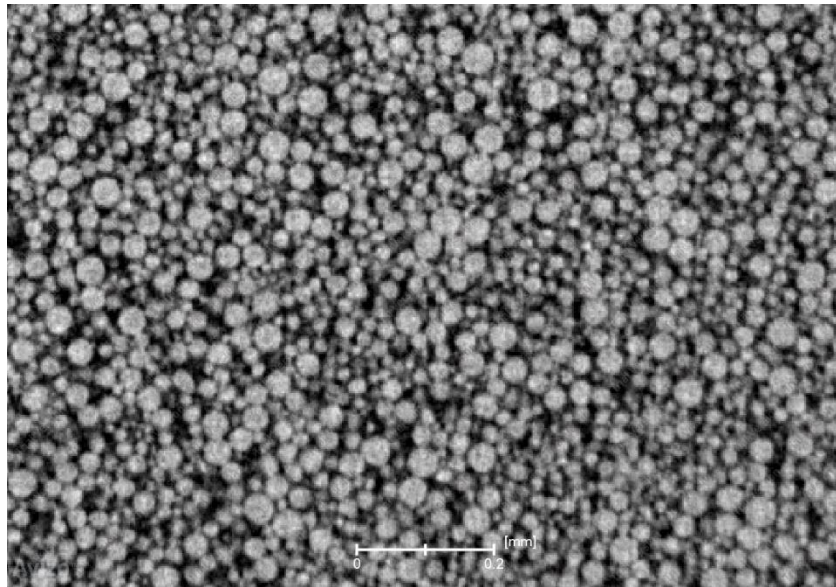
Original radiograph

Applying localised information

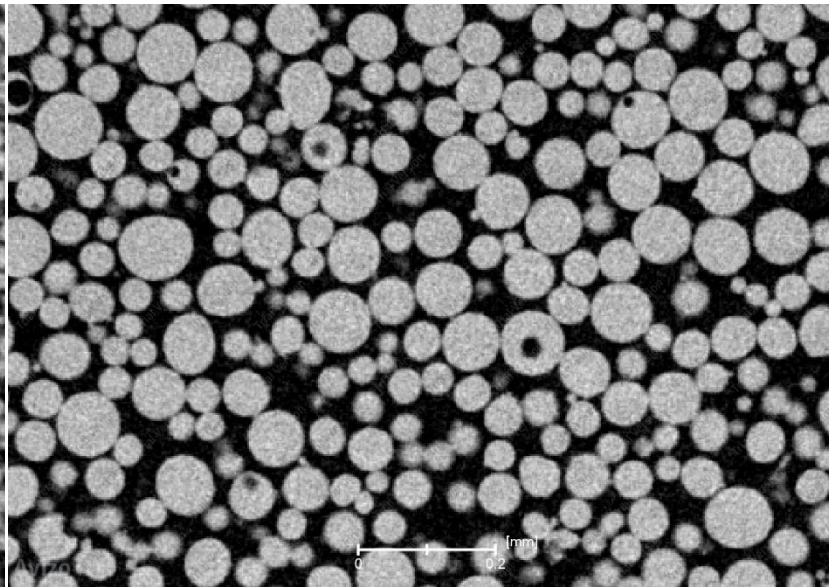


Industrial Market Trial: AM powder NDE

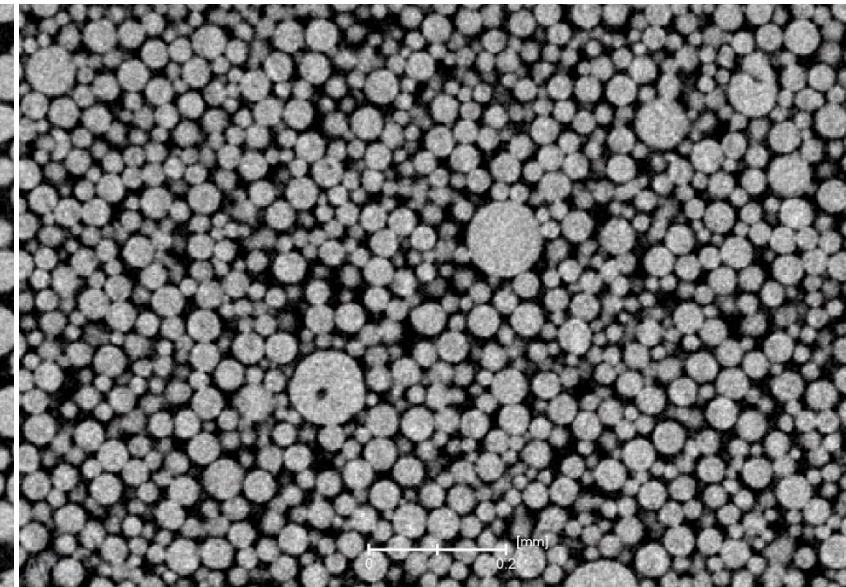




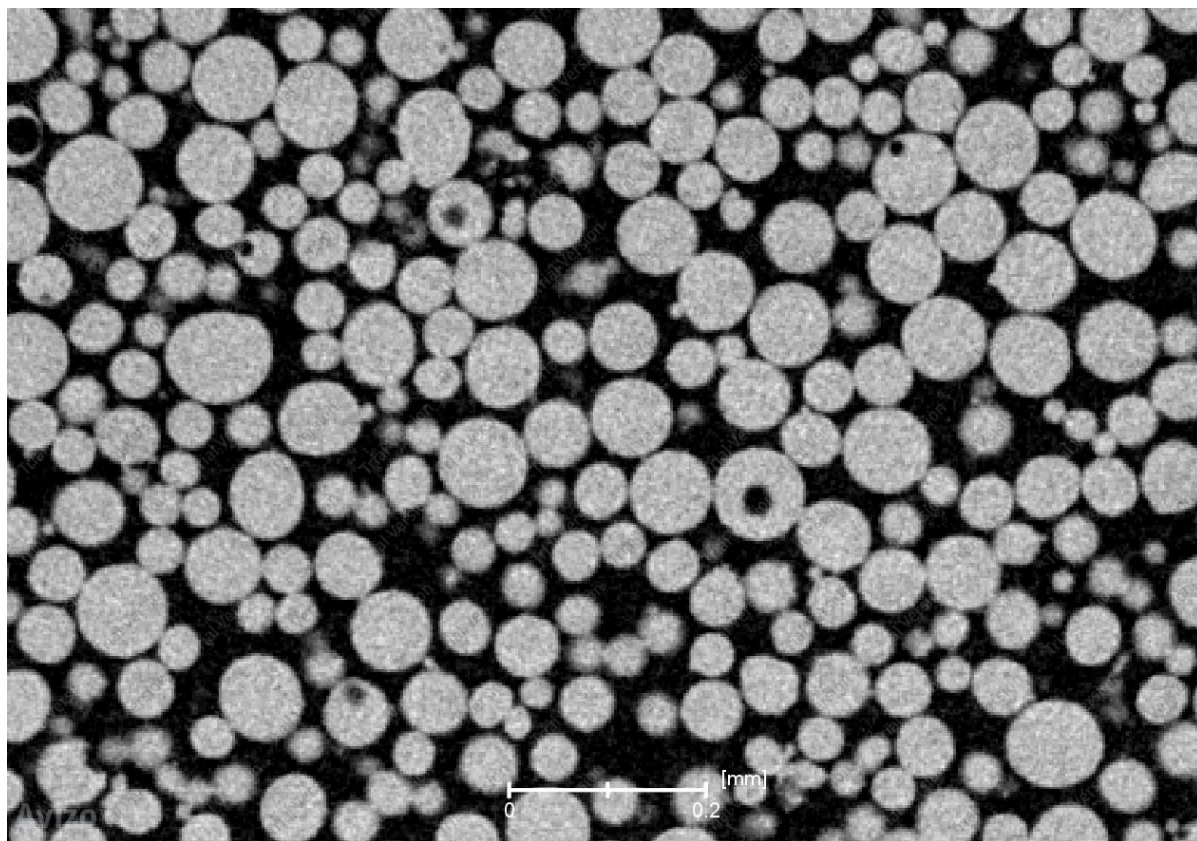
A1



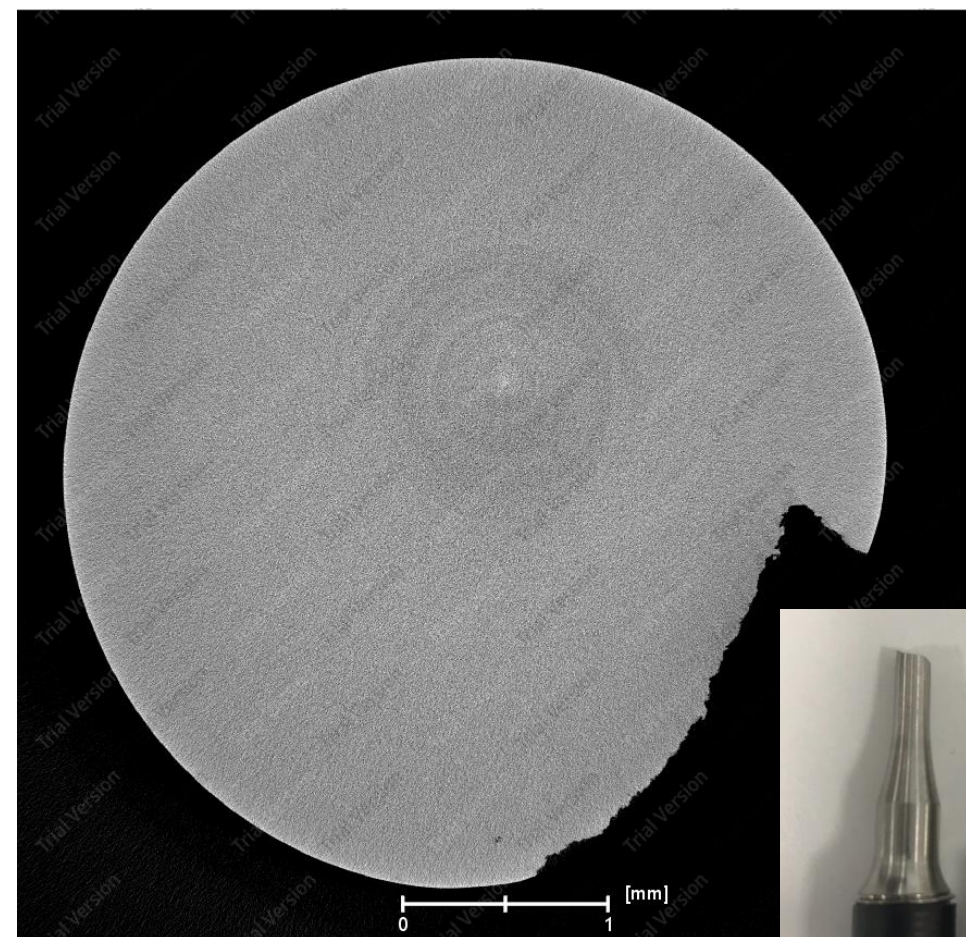
A2



A3

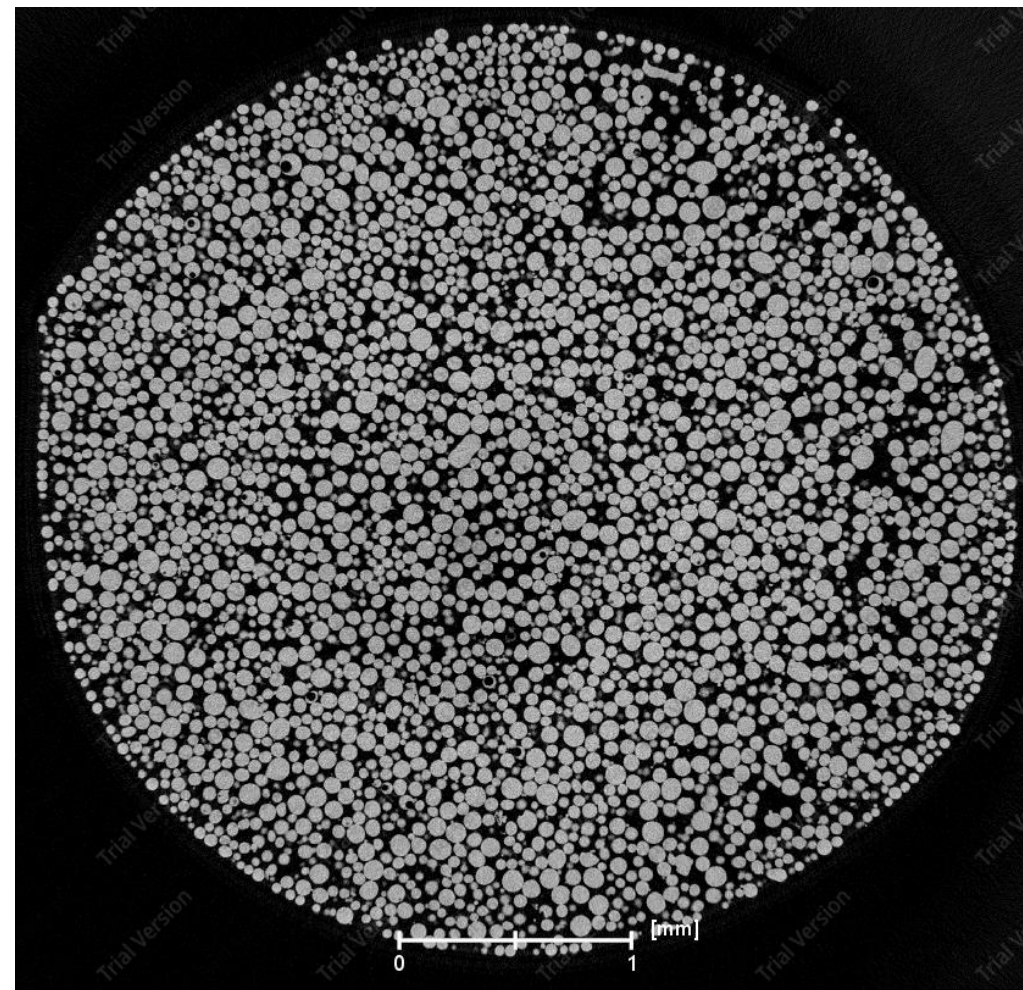
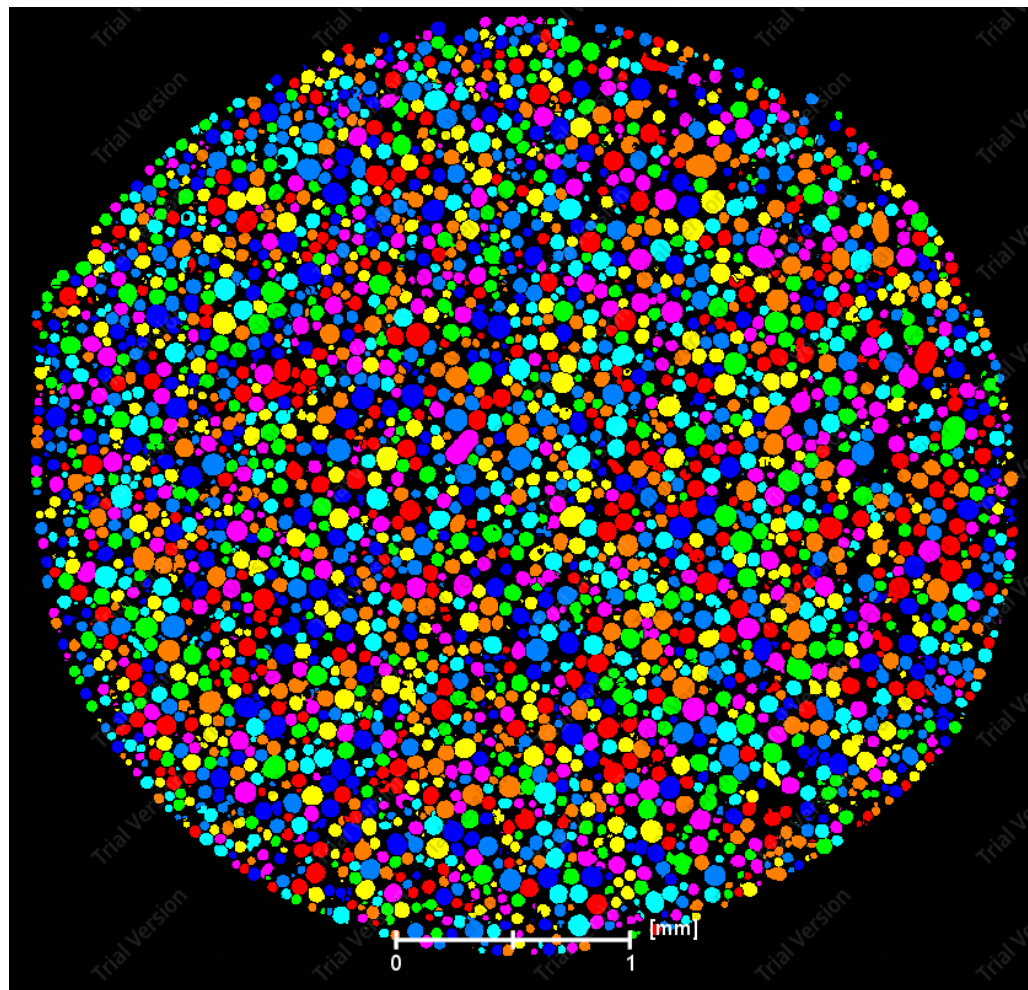


Powder A2



AM dog bone





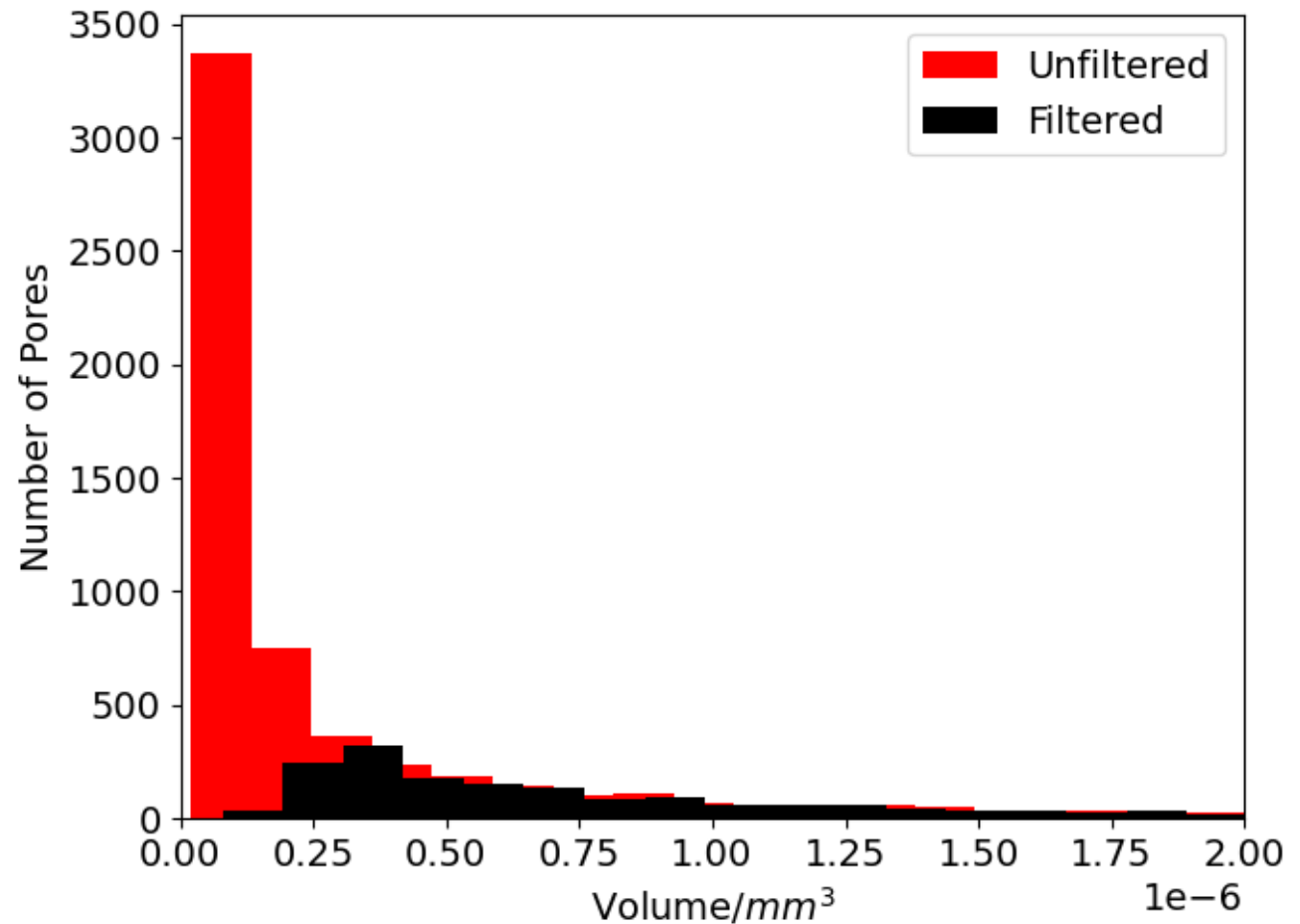
Inter-particle pore analysis

Particles analysed: 169297

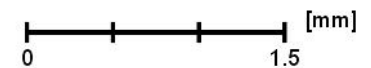
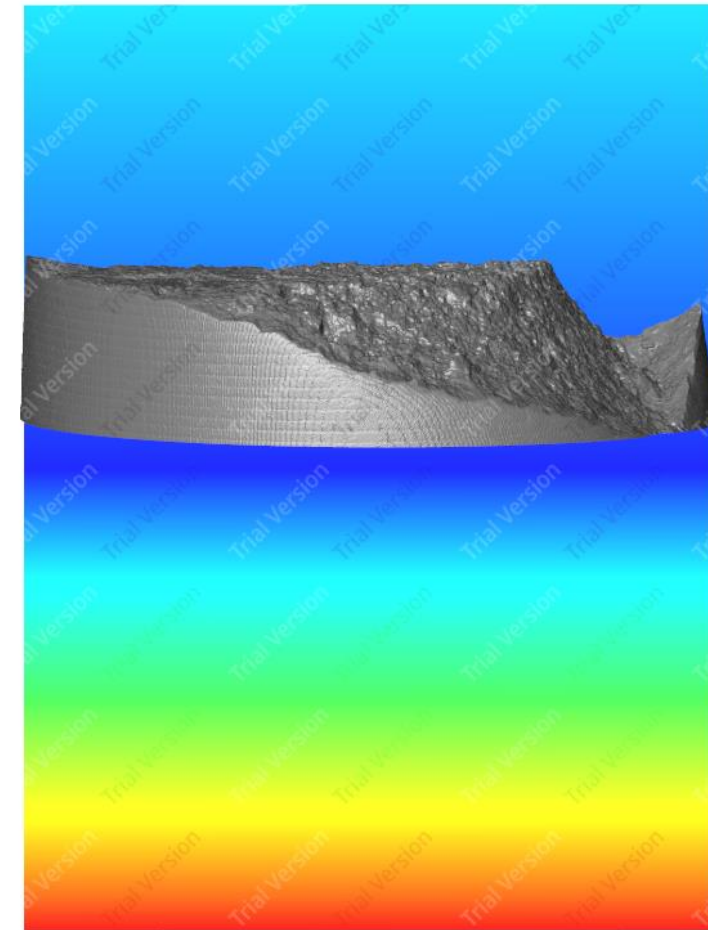
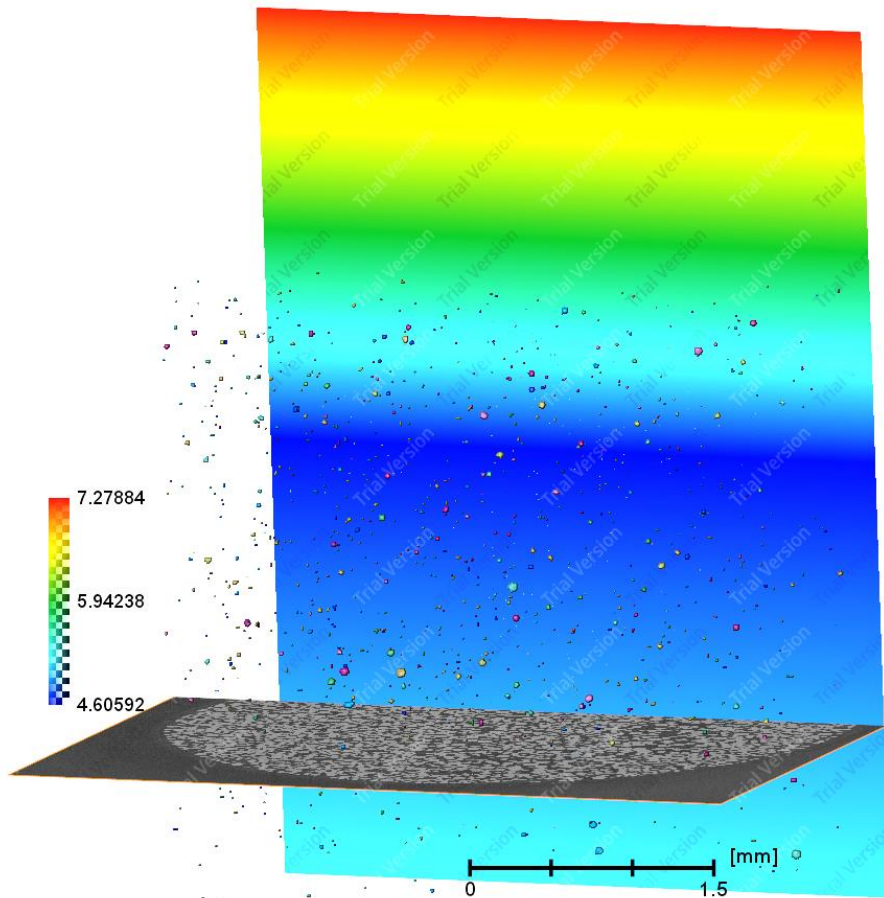
Particle pores: 6277

Particle pores with 4.5 μm
resolution limit: 3426

Particle pores with 6.19 μm
resolution limit: 2228



Intelligent measurement confidence application



Summary

- Aletheia Imaging Solutions is the only provider of bespoke RQIs for engineering applications
- RQI shape and material **must** match actual specimen
- Optimise scan settings for radiographic quality
- Localised image quality measurements
- Measurement confidence