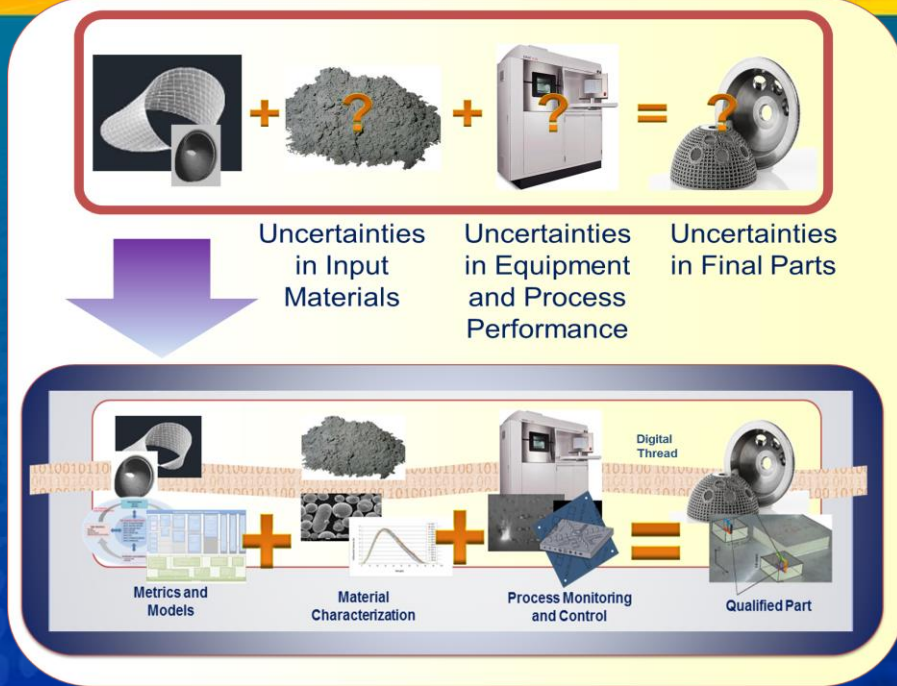
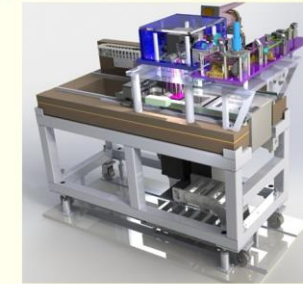


# Measurement Science for Additive Manufacturing

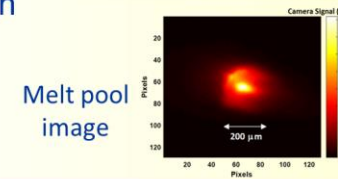


## Real-Time Monitoring and Control of AM Processes

- Methods to enable in-situ process monitoring
- Comparison of high-fidelity measurements to low-fidelity sensor signals
- Reference data for intelligent controller design
- Additive Manufacturing Metrology Testbed



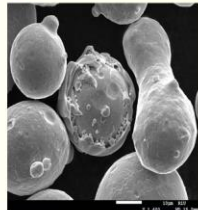
- NIST AM Metrology Testbed**
- Custom design/build
  - Open platform; laser powder bed fusion
  - Instrumented for process monitoring, control, and optimization



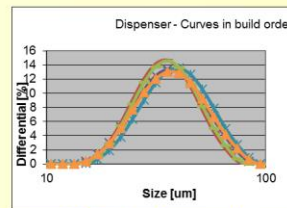
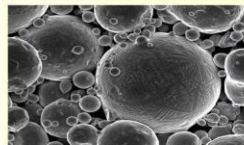
Initial tests of testbed laser

## Characterization of AM Materials

- Methods to characterize metal powder
- Methods to characterize built materials
- Exemplar data
- AM materials public database
- Feedstock / process / part / property correlations



Powder bed density measurements



Effects of powder reuse / recycling



## Qualification for AM Materials, Processes, and Parts

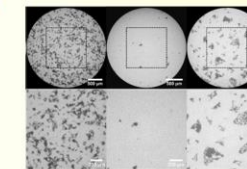
- Pre-process and post-process test methods to characterize performance and assess part quality
- Minimum requirements for testing data to support material and process specifications
- Reference data to improve physics-based models



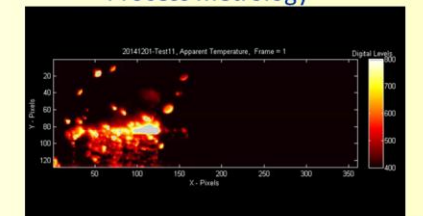
AM test artifact



Process metrology



Porosity analysis





Coming Soon

www.ammd.el.nist.gov

## Systems Integration for AM

- Product definition and tolerance representation for AM
- AM design rules and their fundamental principles
- Characterization, composition, and uncertainty quantification for predictive models
- AM data structures and information models
- Path and process planning at the mesoscale

