

ISO 10303-238 Edition 2

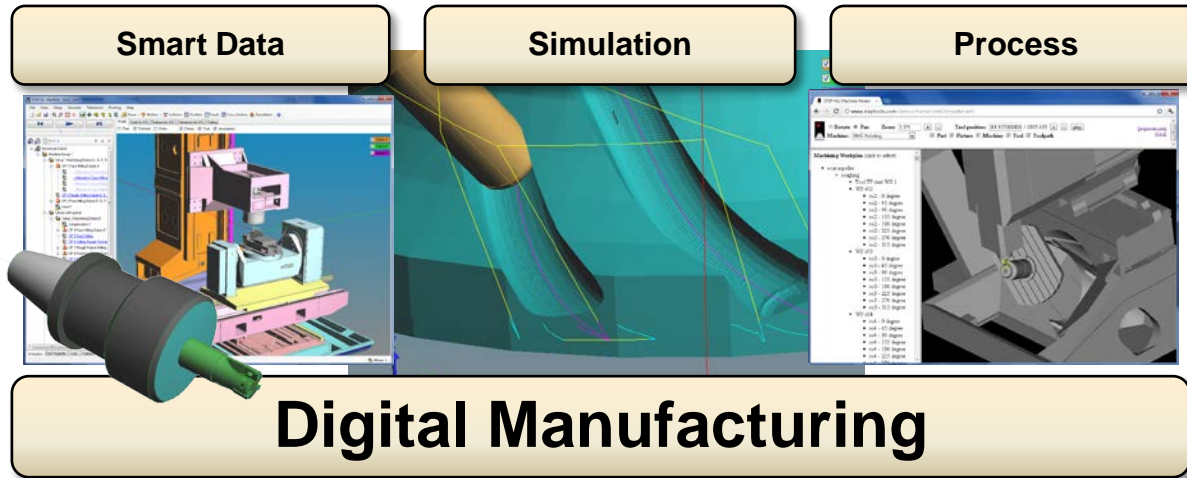
“Integrated Model for Digital Manufacturing”



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Digital Manufacturing using digital models



Automated data assembly

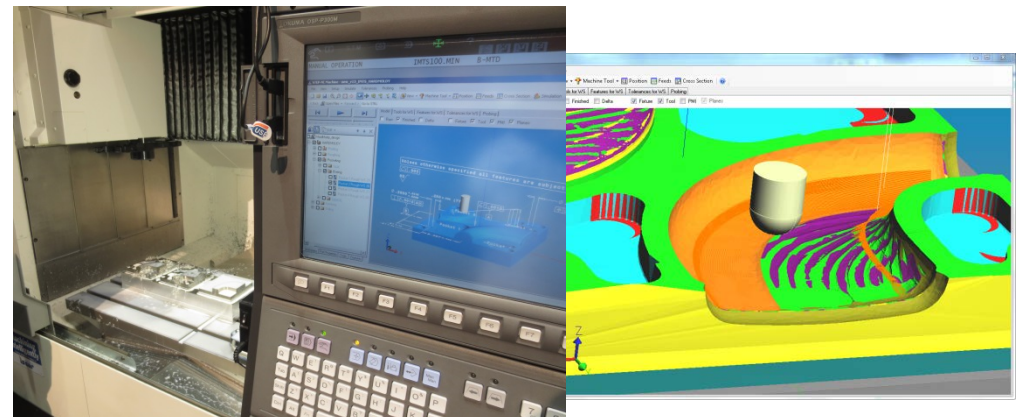
Remote monitoring

Intelligent machining

Virtual CMM

CAM to CAM data exchange

Real time simulation on the CNC



- **Extensive testing of process models**
- **Extensive testing of geometry models**
- **Extensive testing of GD&T**

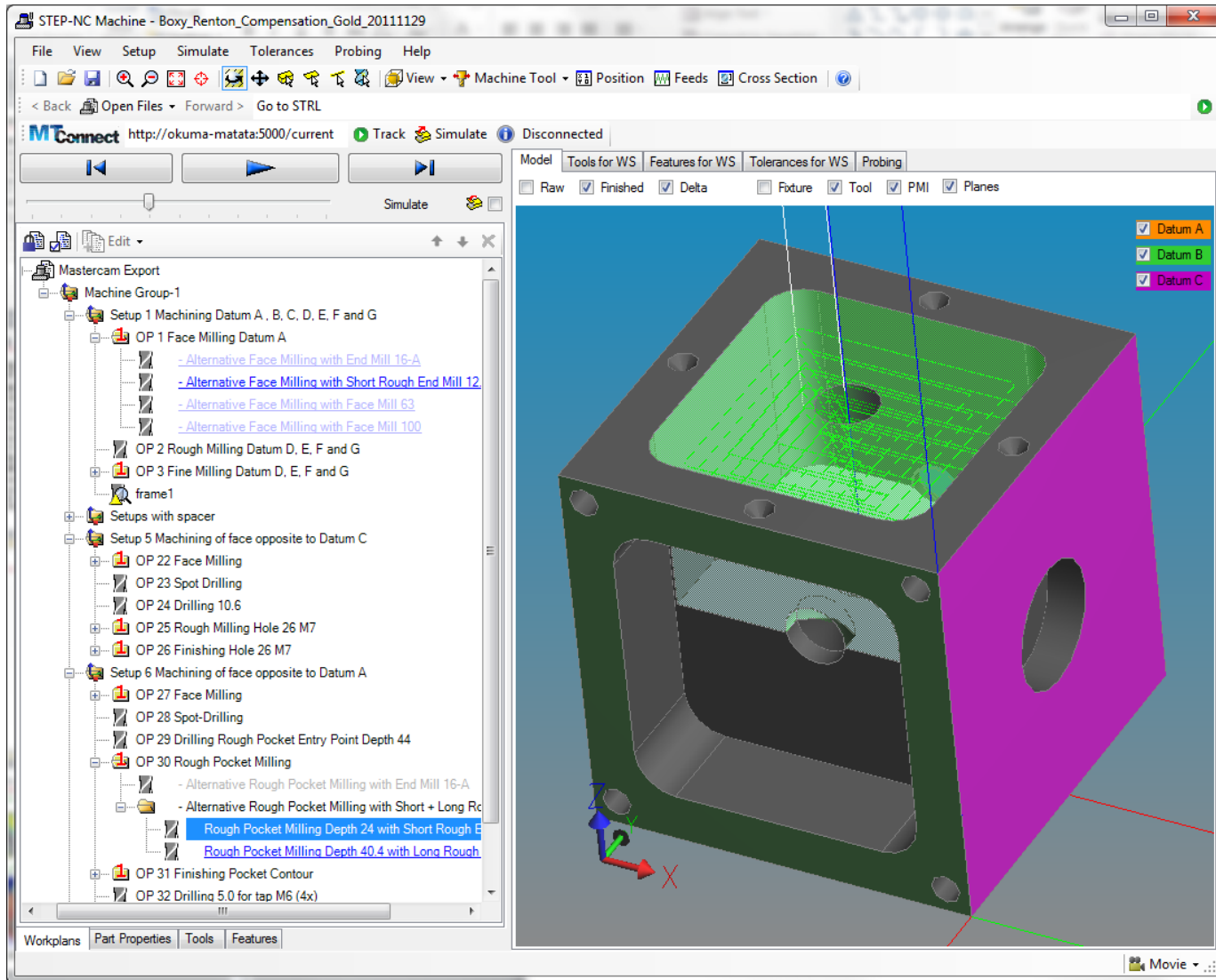
- **No/low usage of feature definitions**
- **No/low usage of operation definitions**
- **No/low usage of tooling parameters**

- **Demonstrated 15% enhancement in machining efficiency**
- **Demonstrated integration with real and virtual CMM**

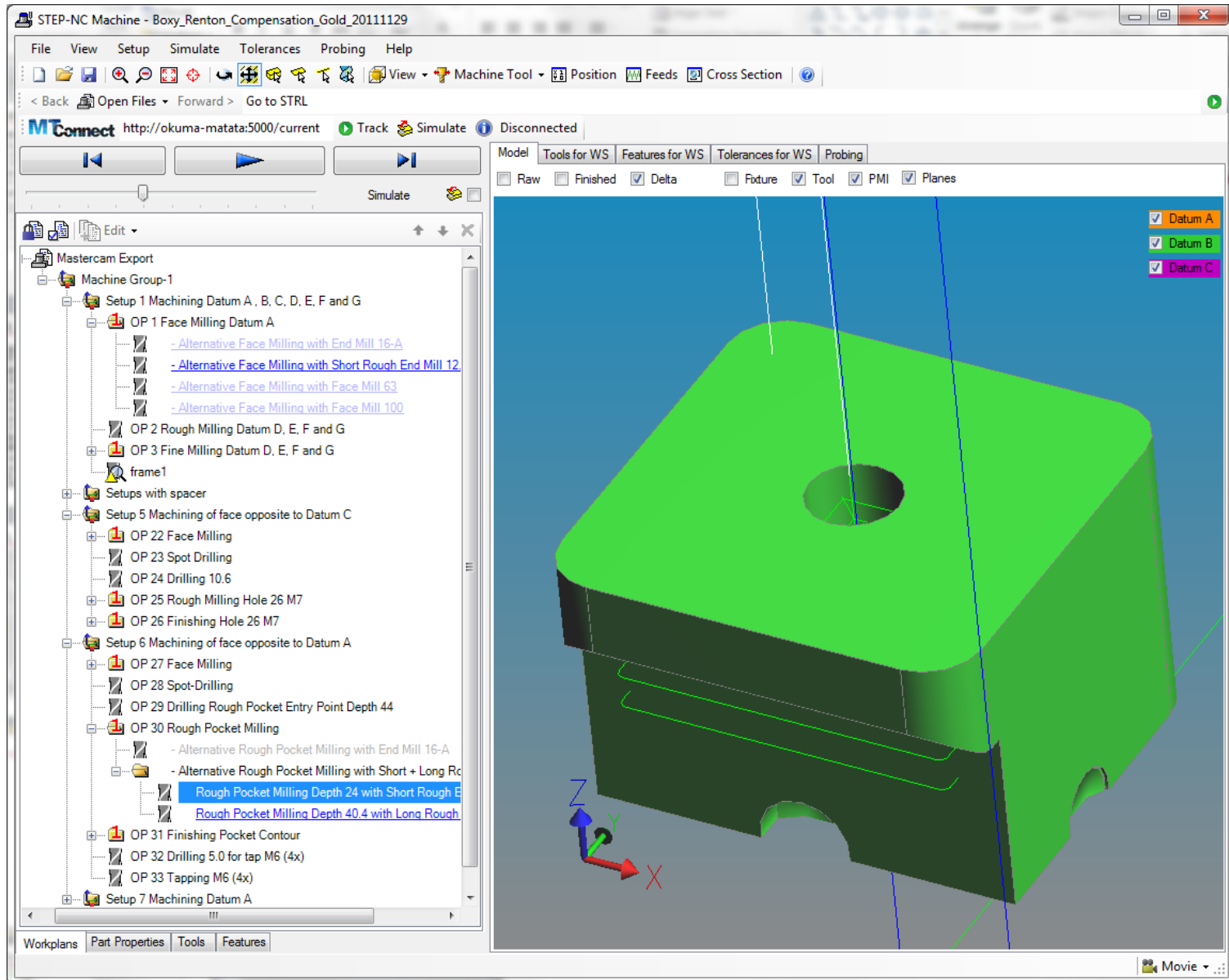
- **Reduce size and complexity, increase flexibility**
 - Retain strong ARM model as defined in ISO 14649 Part 10
 - Reference GD&T model as defined in AP242
 - Reference (not reuse) process specific models from other standards
- **Examples**
 - Reference ISO 13399 tool parameters rather than Part 111 and 112
 - Reference operation parameters in Part 11 / Part 12
 - Move to explicit feature geometry with attached parameters
 - Extend possibilities to include MTConnect for traceability and QIF for measurements

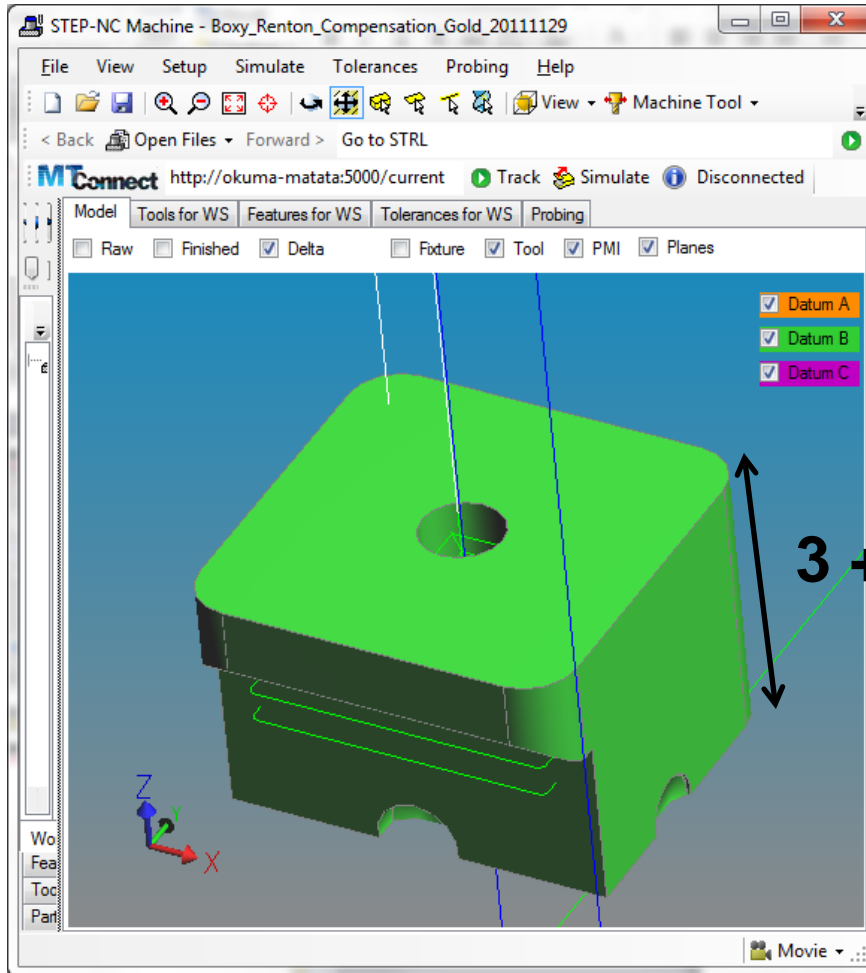
- **During the AP238 Edition 1 testing we added more and more geometry to the toolpath data**
 - In process models
 - Removal volumes
 - Cutting tool models
 - Fixture assemblies
 - Machine tools with kinematics
- **In Edition 2 the feature, tooling and operation parameters will also be attached to these models**
 - Edition 1 mapped them to a canonical definition
 - Edition 2 will associate them to the removal geometry

First example – pocket milling in Boxy



Removal volume of the pocket milling



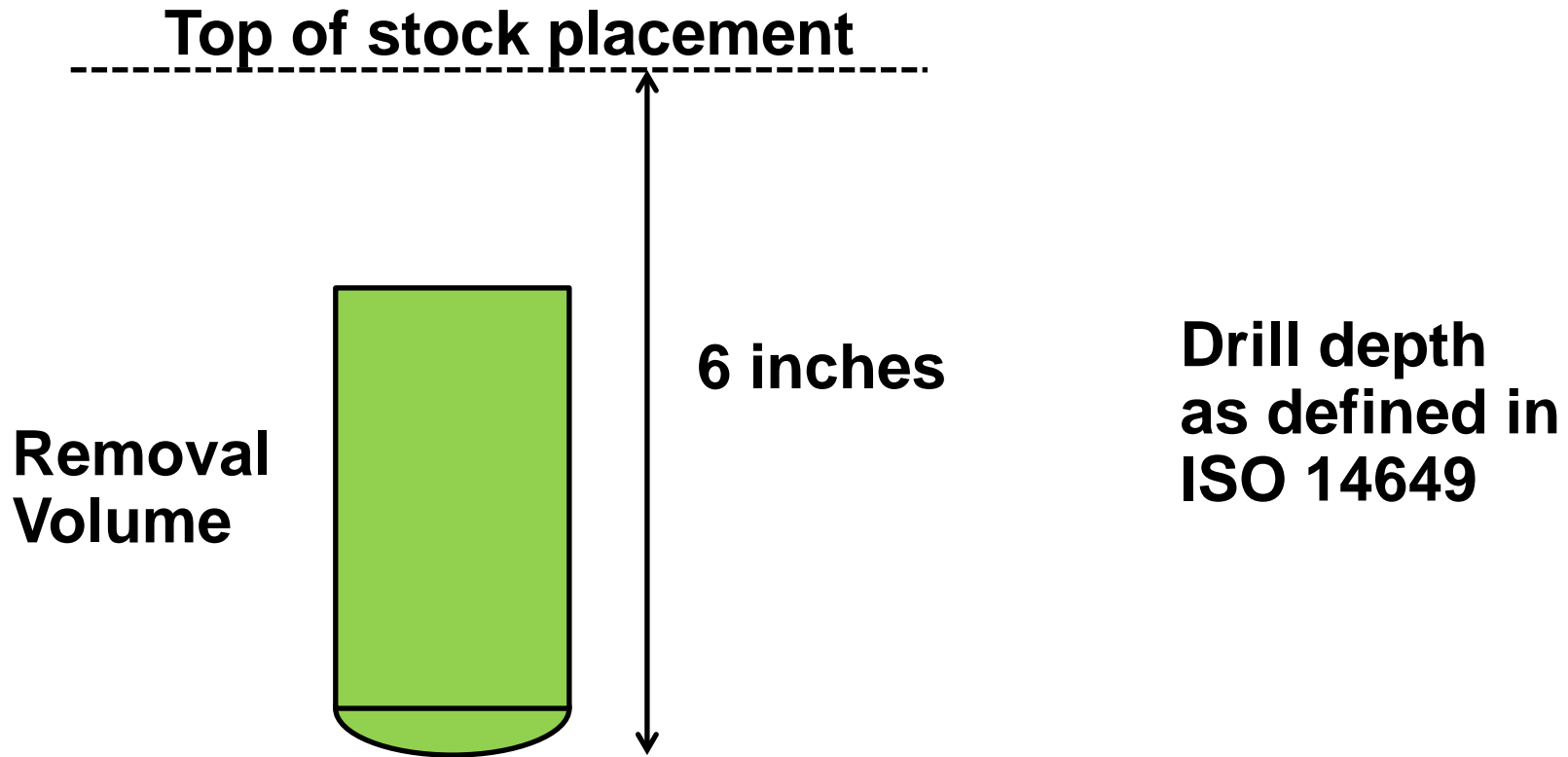


**Pocket depth
as defined in AP224**

**But other AP224
parameters do not fit
so well**

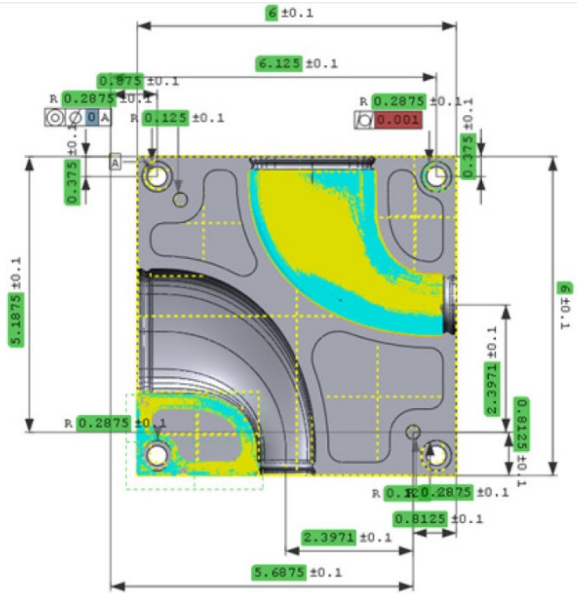
3 +/- 0.1 inch

Full AP224 description would be a “hair ball” of features

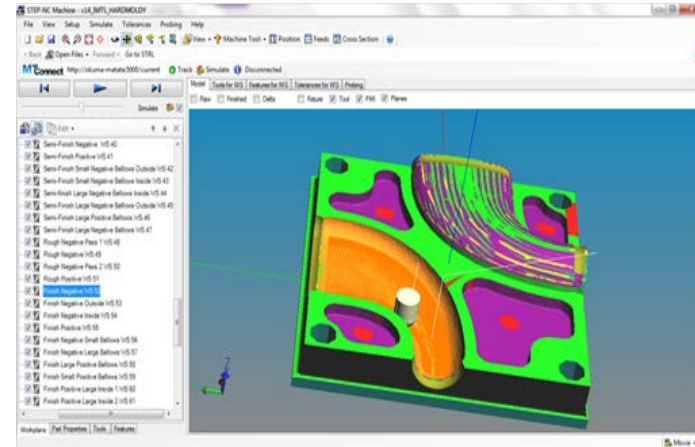


Measurements are from the stock placement which can move between setups

Virtual CMM – new approach has been proven

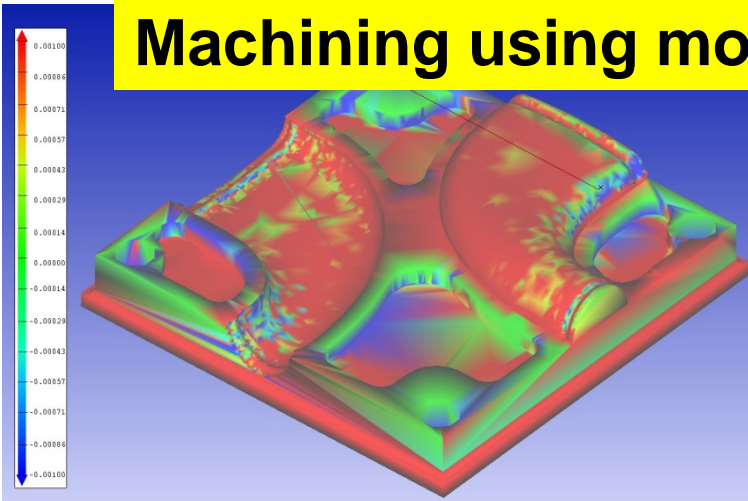


Part with GD&T



Mesh generation

Machining using models and toolpaths only



Virtual Metrology



Real Metrology

What do we gain?

- **Much smaller standard**
- **Ability to measure features in virtual CMM**
 - Currently these values are buried deep inside the AP224
 - Currently they have a canonical definition which may not be the most convenient for measurement
- **Accessible definitions defined in the most appropriate way on the geometry**
 - Tooling – diameter and length
 - Features – length, width, height
 - Operations – orientation, depth of cut
 - Traceability – feed, speed and actual path
 - Measurement results – length, width, height

- **Prepare a draft of the new edition for Baltimore**
 - Without the unwanted ARM objects
 - With the fixes found during the years of testing
 - With new method for referencing external definitions
- **Start the new work item soon after Baltimore**
 - Year 1 gather all the requirements
 - Year 2 test the implementation
- **Form Tiger Team for rapid preparation**
 - Me to lead the project
 - Mikael on how to reference definitions
 - David L on current standard
 - David O on manufacturing
 - Bengt on tooling
 - Charles on manufacturing features