GENERAL ATOMICS

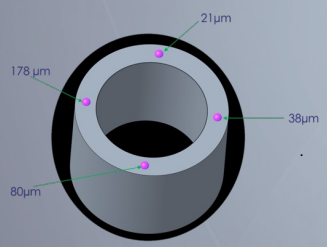
# Identification of Voids & Inclusions in Z Targets*

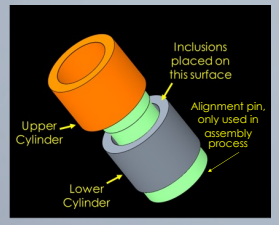
M. Rich[1], K. Tomlinson[1], R. Holt[1], R. Paguio[1]
[1]General Atomics, San Diego, CA 92186

## OVERVIEW

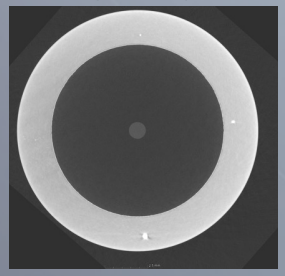
- Voids and inclusions in Be targets for the Z machine can cause instabilities during implosion.
- All target bodies are scanned using CT before assembly to identify and characterize voids and inclusions.
- Theoretically the smallest detectable defect must be covered by a 2v*2v*2v matrix (v=voxel size)
- Creating parts with known defect sizes/locations will allow validation of CT measurements.
- The purpose of this is to validate the detection abilities of the CT machine and current methods being used.

## INCLUSION TARGET

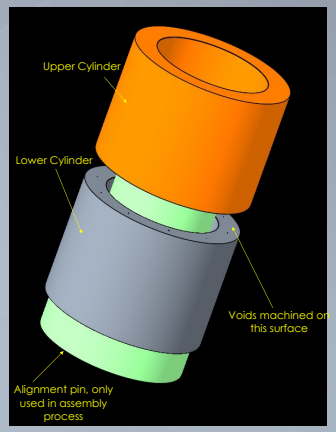


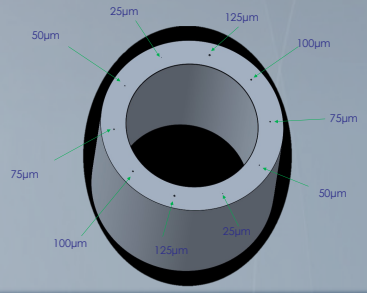

- Stainless steel microspheres pressed in between two aluminum cylinders
- Imitate iron inclusions found in Be targets
- Microspheres measured using measurement microscope before assembly for comparison
- All four sizes of inclusions were able to be seen in CT scan
- CT scan had 17.3 um voxel size
- Smallest size (21um) was not large enough to be confidently measured

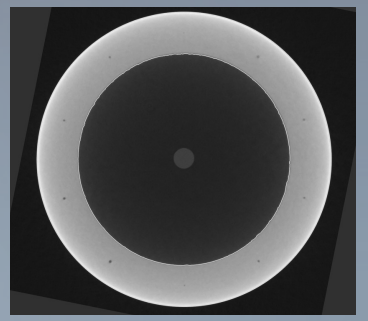


## VOID TARGET




- Voids machined using micro-endmills into lower cylinder
- Epoxied to upper cylinder to simulate sealed voids found inside Be targets
- Voids measured using measurement microscope for comparison.
- Smallest voids were not large enough to be measured
- All of the void sizes could be seen in CT reconstruction



## RESULTS

| Actual Inclusion Size (µm) | CT Measured Size(µm) | % Error |
|---|---|---|
| 21 | - | - |
| 38 | 46 | 21.1% |
| 80 | 85 | 6.3% |
| 178 | 173 | 2.8% |

Measurements were taken using the software (NSI) of the CT machine. Measurements taken using Volume Graphics defect detection tool do not match the actual or NSI measurements.

| Actual Void Diameter (µm) | CT Measured Size (µm) | % Error |
|---|---|---|
| 51 | - | - |
| 73 | 90 | 23.3% |
| 101 | 96 | 5.0% |
| 138 | 127 | 8.0% |
| 174 | 165 | 5.2% |
| 51 | - | - |
| 71 | 81 | 14.1% |
| 109 | 88 | 19.3% |
| 129 | 125 | 3.1% |
| 172 | 162 | 5.8% |

## NEXT STEPS

- Create identical parts out of Be to more accurately assess detectability of different Z values
- Identify the proper Volume Graphics settings needed to match measurements to NSI measurements
- Create array of sizes to be used as Reference Quality Indicators
- Further refinement of scan parameters to minimize X-Ray artifacts

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