Flexible and Fast Designing of Cryogenic Targets for the National Ignition Facility (NIF)

Scott Vonhof, Jeremy Kroll

Motivation

• As we moved from a handful of new targets each year to hundreds, we needed to decrease the designer time required for each new version.
• Designer time to turn around a new target was 40+ hours, even for a “simple” change.
• Examples of “Simple” changes:
  • Capsule dopant (no change to the size) still required a new target drawing
  • Material change on hohlraum
  • Positioner change (angles for diagnostics rotate to match positioner)
  • LEH diameter

Added flexibility in parts to allow use on multiple target positioners or configurations

Fiducials for Target alignment allowing for upper, lower, Tarpos, and CryoTarpos configurations

Fill tube holes allow for use on either positioner

Dual fill tube notches to allow parts to be used for different positioners

By making parts multi-purpose, we reduced required inventory and supply

Main component grouping
(all use the same common reference frame)

Choose TMP Assemblies (22 available)
Choose DB Assembly (15 available)
Choose Base Assembly (12 available)
Choose Cover Assembly (3 available)
Choose Shield Assembly (as required) (3 available)

Choose the parts needed to complete the specific target design from a list of common parts or make new parts to fit your needs

Hohlraums
LEH Inserts
CFTA/Capsule
Tents (as needed)
HDC windows (as needed)
Cone & mirror (as needed)
Backlighter (as needed)

What we did to simplify the drawings

• Standardized tooling, metrology and assembly documents
  • Eliminated need to have every assembly step shown in the drawing
  • 4 assembly documents cover ~95% of the cryogenic targets built
  • No longer tied to the assembly drawing
  • Amount of metrology data recorded was reduced

Simple Bill of Materials

Choose the parts needed to complete the specific target design from a list of common parts or make new parts to fit your needs

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LEH Inserts
CFTA/Capsule
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Cone & mirror (as needed)
Backlighter (as needed)

With capsule and hohlraum material changes and LEH insert sizes available, it is an almost unlimited number of combinations

Target Assembly Drawing Circa 2009
15 sheet drawing required a designer to spend 40+ hours for each version of a target assembly

Present Day Target Assembly Drawing
1 sheet drawing requires a designer to spend 30 minutes or less for each version of a target assembly

Target Assembly Drawing Circa 2011
7 sheet drawing required a designer to spend 20+ hours for each version of a target assembly

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19 Target types, 2 positioners, 10 target scales = 380 combinations

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Fiducial notches for identifying the positioner for the target

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By reducing the time spent on standard style targets, we have been able to concentrate our time and efforts on more difficult non-standard targets

Hours Required for Each New Target Drawing

2009
2011
2016
0
10
20
30
40
50

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