NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

July 10, 2020

Computed Tomography Specialist's Factual Report

CEN20FA070

A. ACCIDENT

Location:	Abraham Lincoln Capital Airport (SPI), Springfield, Illinois
Date:	January 28, 2020
Time:	1503 central standard time
Airplane:	Piper PA-60-601P airplane, N6071R

B. GROUP

Computed Tomography Specialist:	Scott Warren National Transportation Safety Board Washington, D.C.

C. SUMMARY

On January 28, 2020, about 1503 central standard time, a Piper PA-60-601P airplane, N6071R, collided with terrain while on an instrument approach to Abraham Lincoln Capital Airport (SPI), Springfield, Illinois. The airline transport pilot, 2 passengers, and a dog were fatally injured. The airplane was destroyed during a postimpact fire. The airplane was owned by LKJ Properties, LLC, and operated under Title 14 *Code of Federal Regulations* Part 91 on an instrument flight rules (IFR) flight plan. Day instrument meteorological conditions (IMC) prevailed at the accident site. The personal cross-country flight departed Huntsville International Airport (HSV), Huntsville, Alabama, at 1301.

The internal configuration of an annunciator panel was documented using radiographic images that were collected from February 18-20, 2020 in Chicago, Illinois. A total of 6,857 computed tomography (CT) slice images were examined, processed, and analyzed by the NTSB to evaluate the components.

Review of the images determined that the CT images were able to show the overall condition of the filament within each bulb. The CT images were not able to show the individual coils within each filament. In general, being able to visualize distortion levels within the individual filament coils is required to analyze the bulb filament. There were no obvious tangled/stretched/distorted filaments that would indicate a bulb was on at impact, but there were some filaments that had some visible distortions.

D. DETAILS OF THE INVESTIGATION

1.0 General

The internal configuration of an annunciator panel was subjected to x-ray radiograph and computed tomography (CT) scanning to document its internal conditions. The scanning was conducted from February 18-20, 2020 by Varex, Inc under the direction of the NTSB using the Actis 500/225 micro focus system.

For the CT scans, the component was loaded into the imaging unit and placed on a turntable. The component was then rotated in front of the x-ray source, and the x-rays were captured by a detector after they went through the part. The x-ray source produced a cone shaped beam of x-rays, and the portion of the part imaged was adjusted slightly after each scan was completed until the entire assembly (or region of interest of the part) was scanned. The x-ray energy levels measured by the detector were recorded at several thousand different points during each rotation, and this information was converted into slice images using reconstruction algorithms.

The component was scanned using a total of 6,857 slices, and the total size of the combined data sets was approximately 53.6 GB. The complete scan protocol is given in table 1. The digital radiograph and CT axial slice images were provided by Varex to the NTSB where they were examined, processed, and analyzed to evaluate the component.

Table 1
Scan Protocol

Component	Annunciator panel
Number of slices	6857
Voxel[1] Size - X Direction (mm)	0.022
Voxel Size - Y Direction (mm)	0.022
Voxel Size - Z Direction (mm)	0.030
Image Projections per Revolution	1440
Exposure time (ms)	285.61
Frames to Avg (frames per projection)	2
X-ray Source Voltage (kV)	222
X-ray Source Current (mA)	0.550
Source Filter Thickness (mm)	1
Source Filter Material	Brass
Image Matrix Size	2048 x 2048

The data set of slice images was examined, processed, and analyzed by the NTSB using the VGStudioMax software package to convert the axial slice data into orthogonal slice images and a three-dimensional reconstructed image of the component. As part of the evaluation, some sections of the component were digitally removed or rendered transparent to allow closer observation of interior parts. In the images, the higher density areas were shown as brighter shades of gray and lower density areas were shown as darker shades of gray. The pointers shown in some of the images denote specific areas of interest within that image.

The annunciator consisted of two rows of eight lighted annunciator compartments with each compartment containing two light bulbs. Each compartment was

[1] A voxel is a three-dimensional picture element (pixel).

assigned a row and column number starting from the top left of the annunciator panel. The uppermost left compartment was numbered as 1-1, and the lower right compartment was numbered 2-8. Within each compartment, the left-hand bulb was labeled “a” while the right-hand bulb was labeled “b”. For example, the right-hand bulb in the fourth compartment from the left in the lower row would be labeled bulb 2-4b.

The images of the component were examined for any signs of missing or damaged parts, contamination, or any other anomalies. The filament within each light bulb was examined for distortions or fractures. Specific results (including example images) are presented in subsequent sections of this report.

2.0 Computed Tomography Results

The computed tomography (CT) results for the component are shown in figures 1 through 29. Review of the images determined that the CT images were able to show the overall condition of the filament within each bulb. The CT images were not able to show the individual coils within each filament. In general, being able to visualize distortion levels within the individual filament coils is required to analyze the bulb filament. There were no obvious tangled/stretched/distorted filaments that would indicate a bulb was on at impact, but there were some filaments that had some visible distortions.

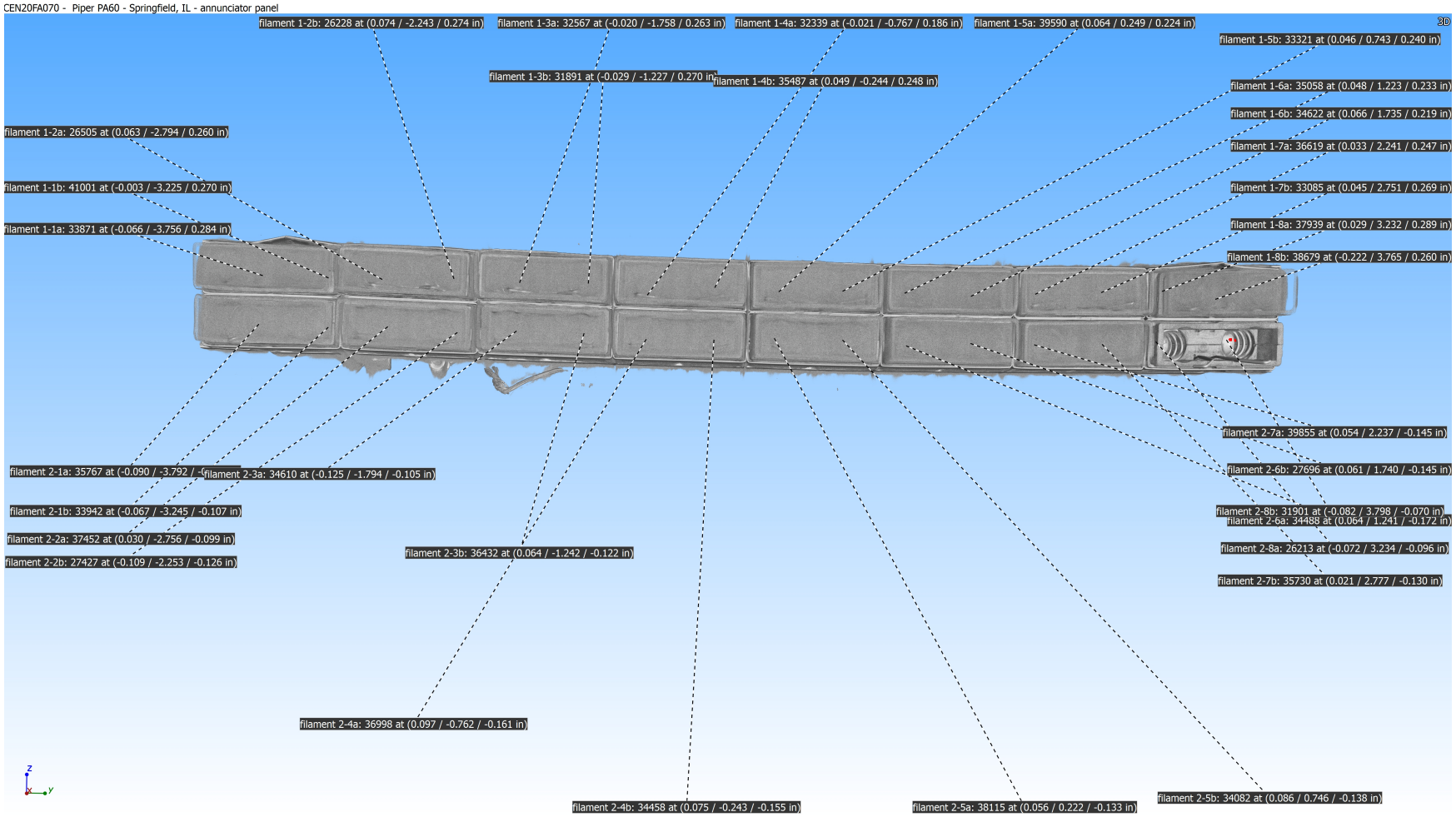


Figure 1
Annunciator panel - overview

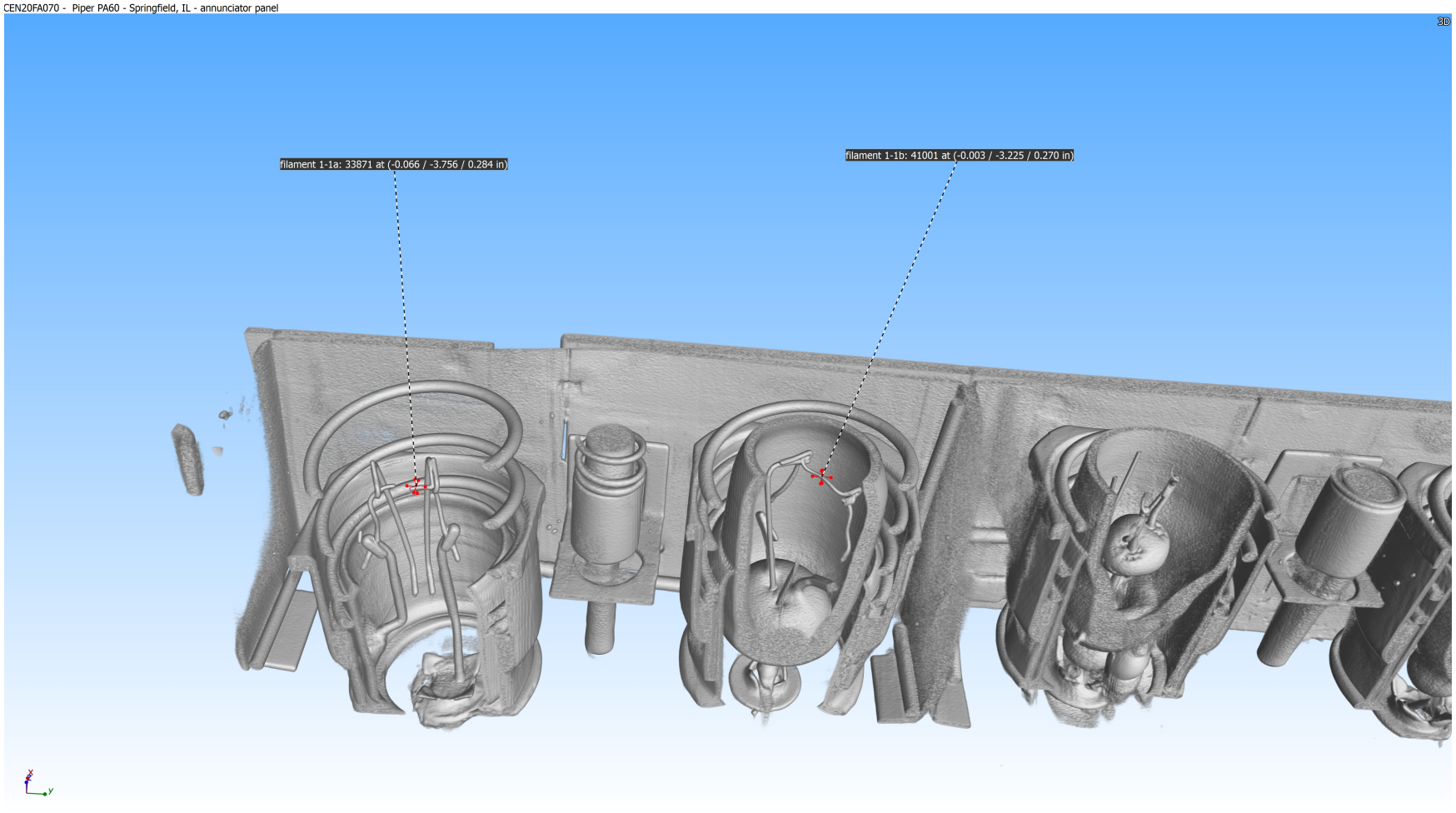


Figure 2
Filaments 1-1a and 1-1b

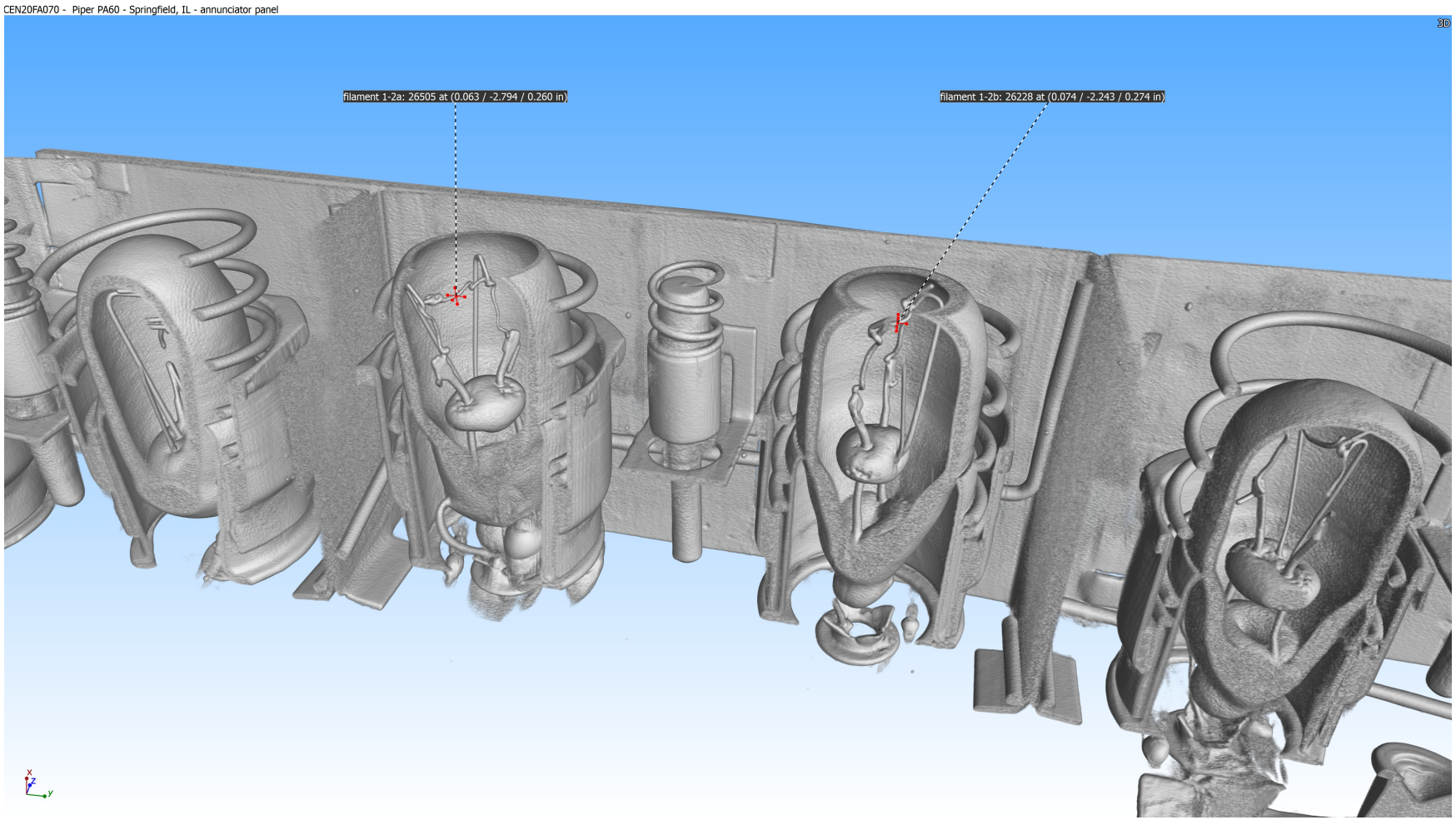


Figure 3
Filaments 1-2a and 1-2b

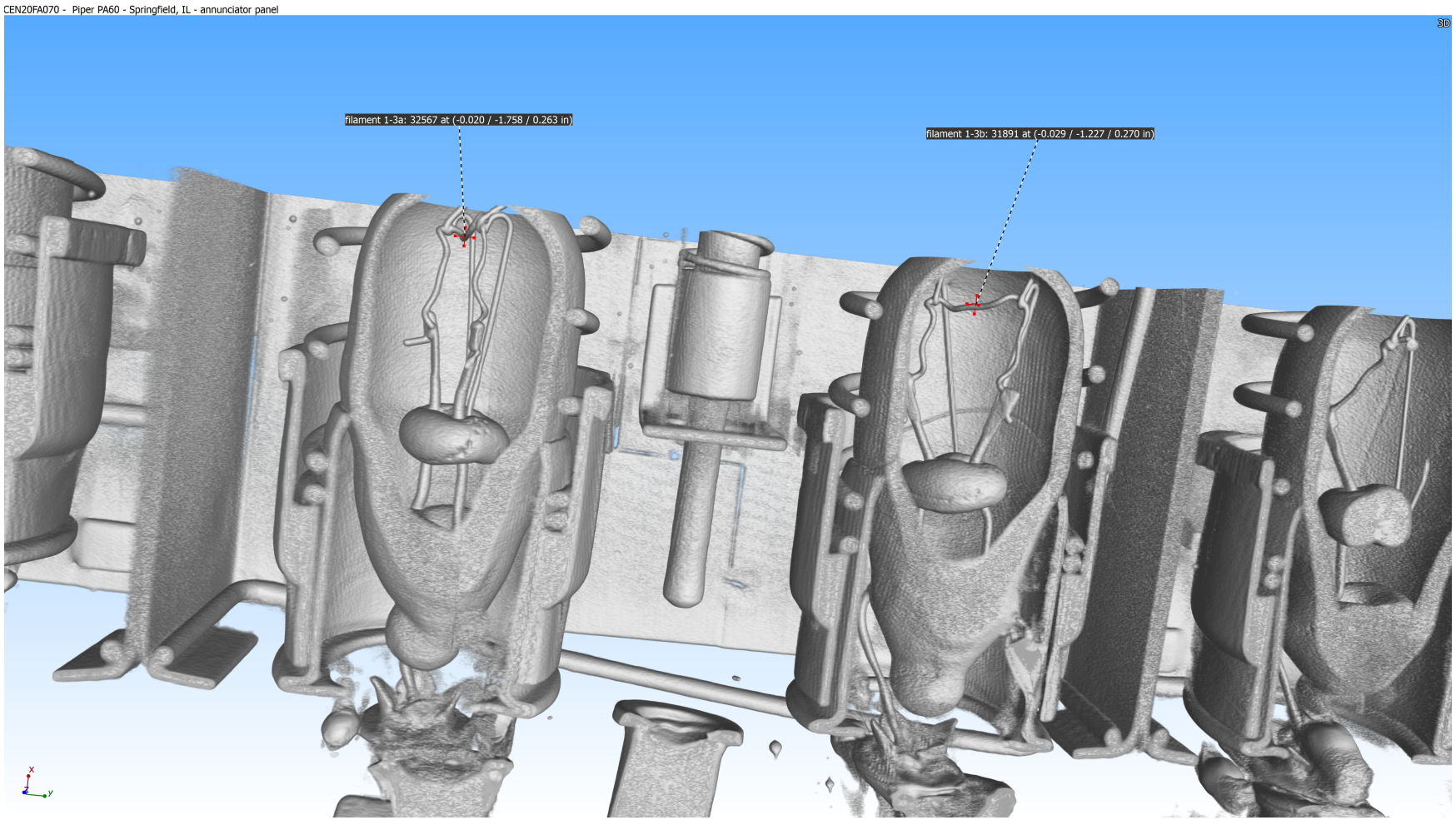


Figure 4
Filaments 1-3a and 1-3b

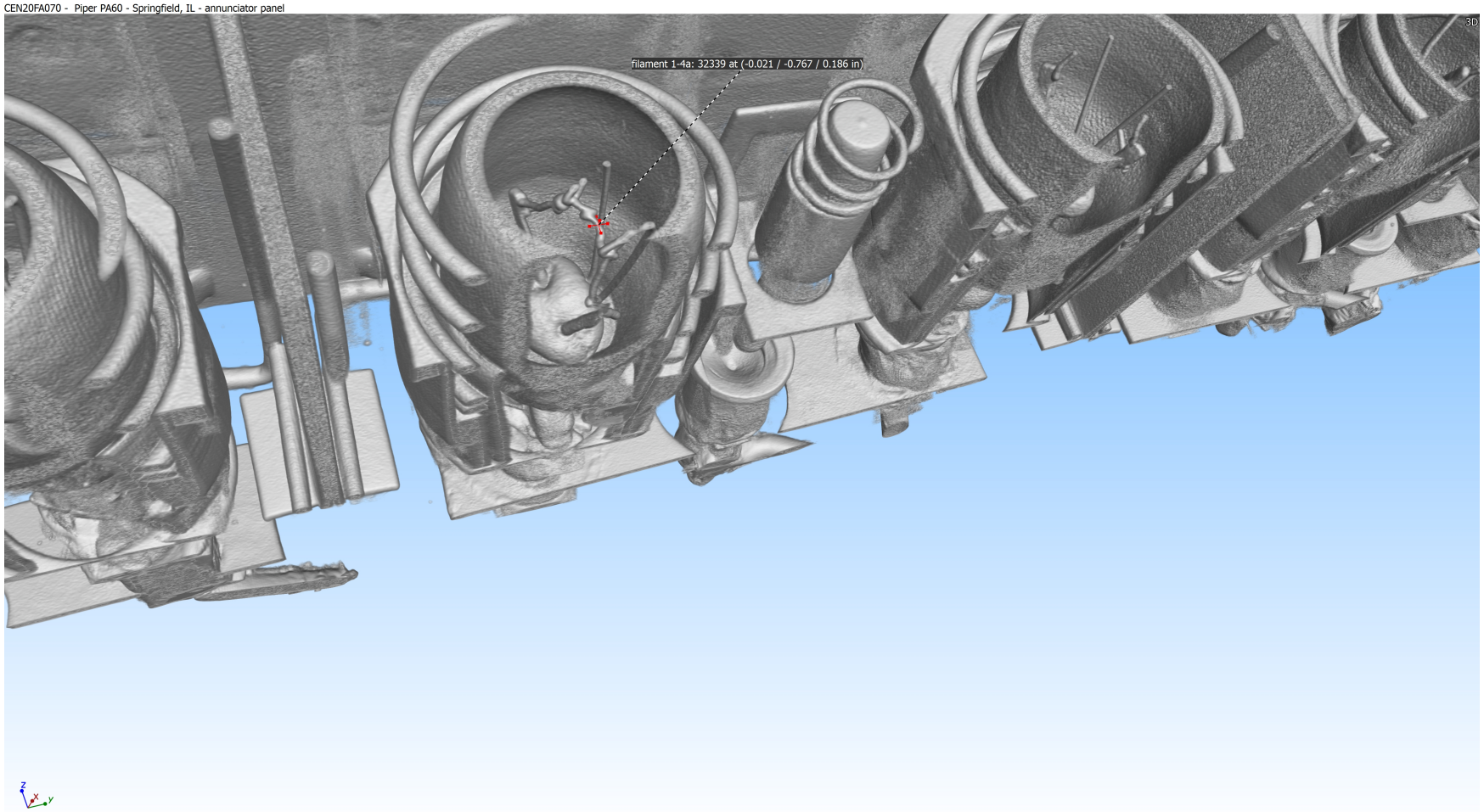


Figure 5
Filament 1-4a

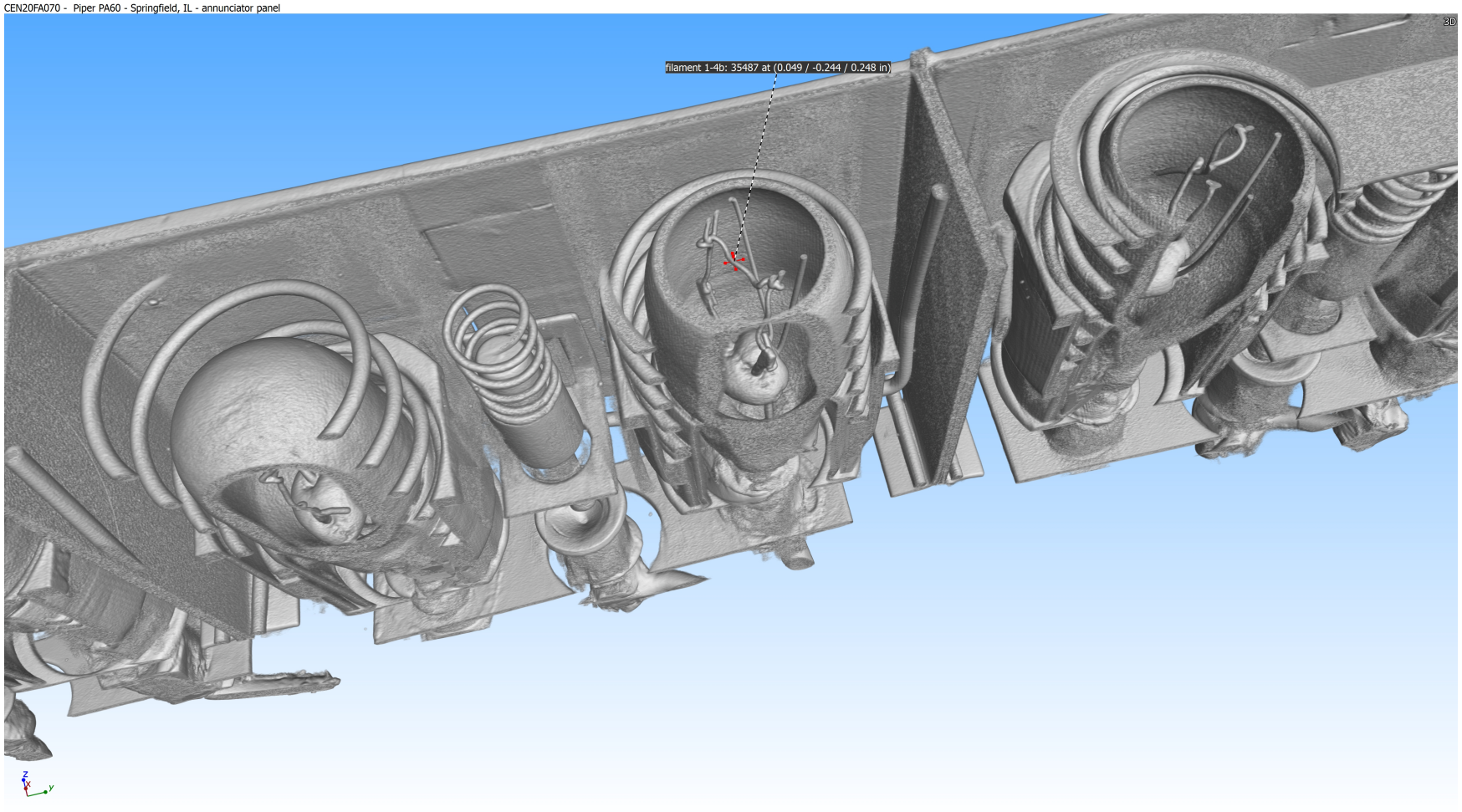


Figure 6
Filament 1-4b

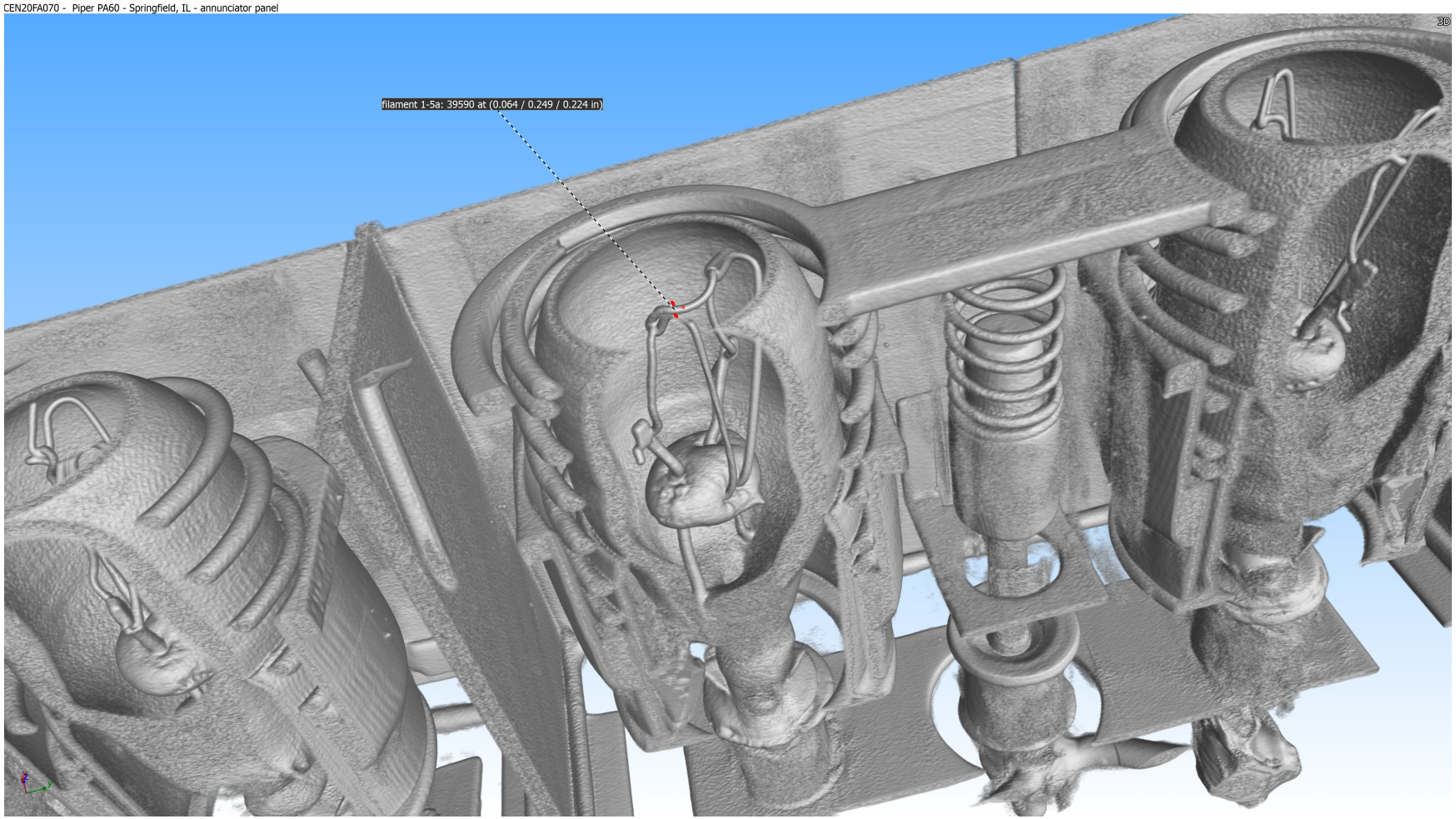


Figure 7
Filament 1-5a

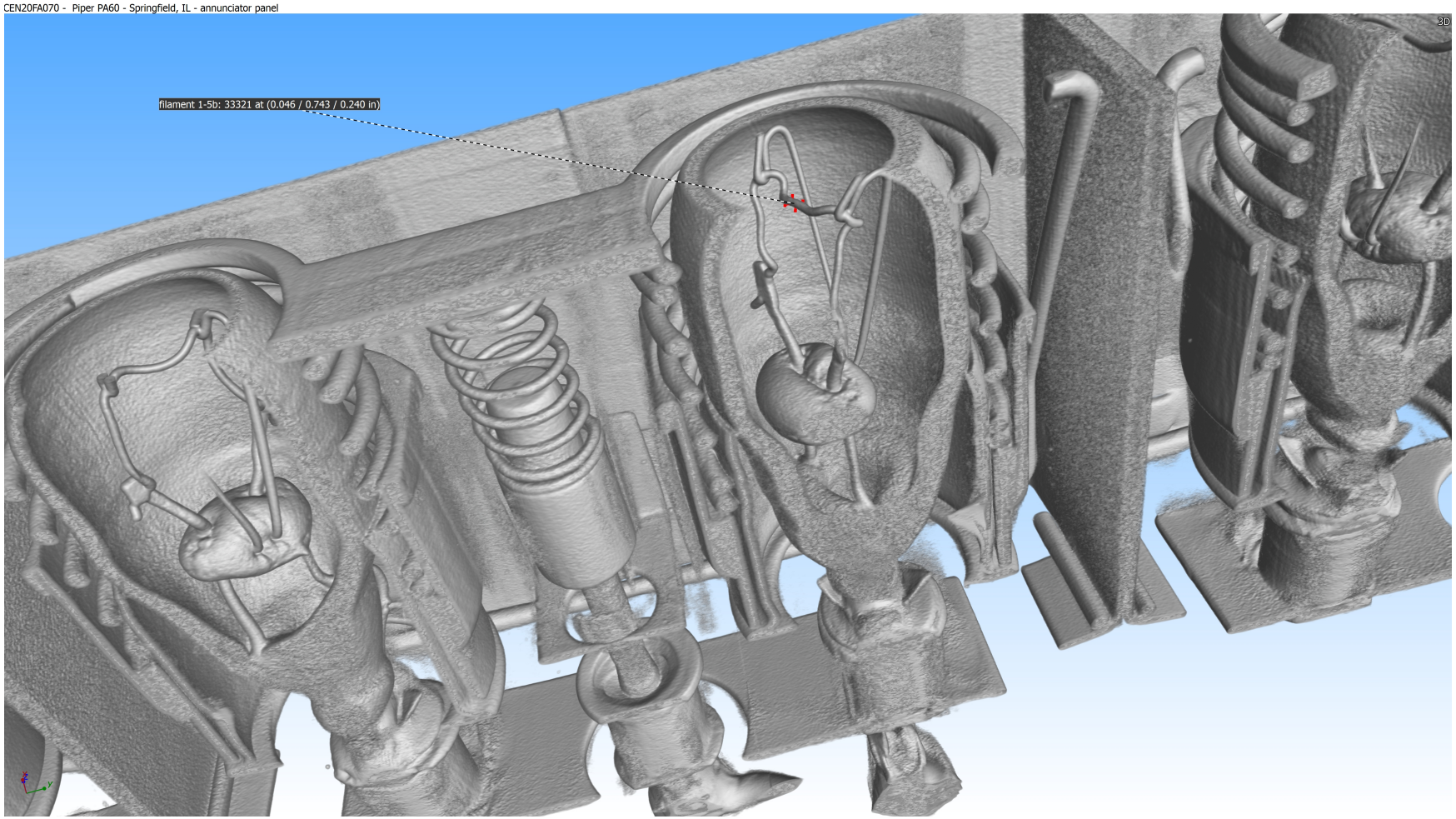


Figure 8
Filament 1-5b

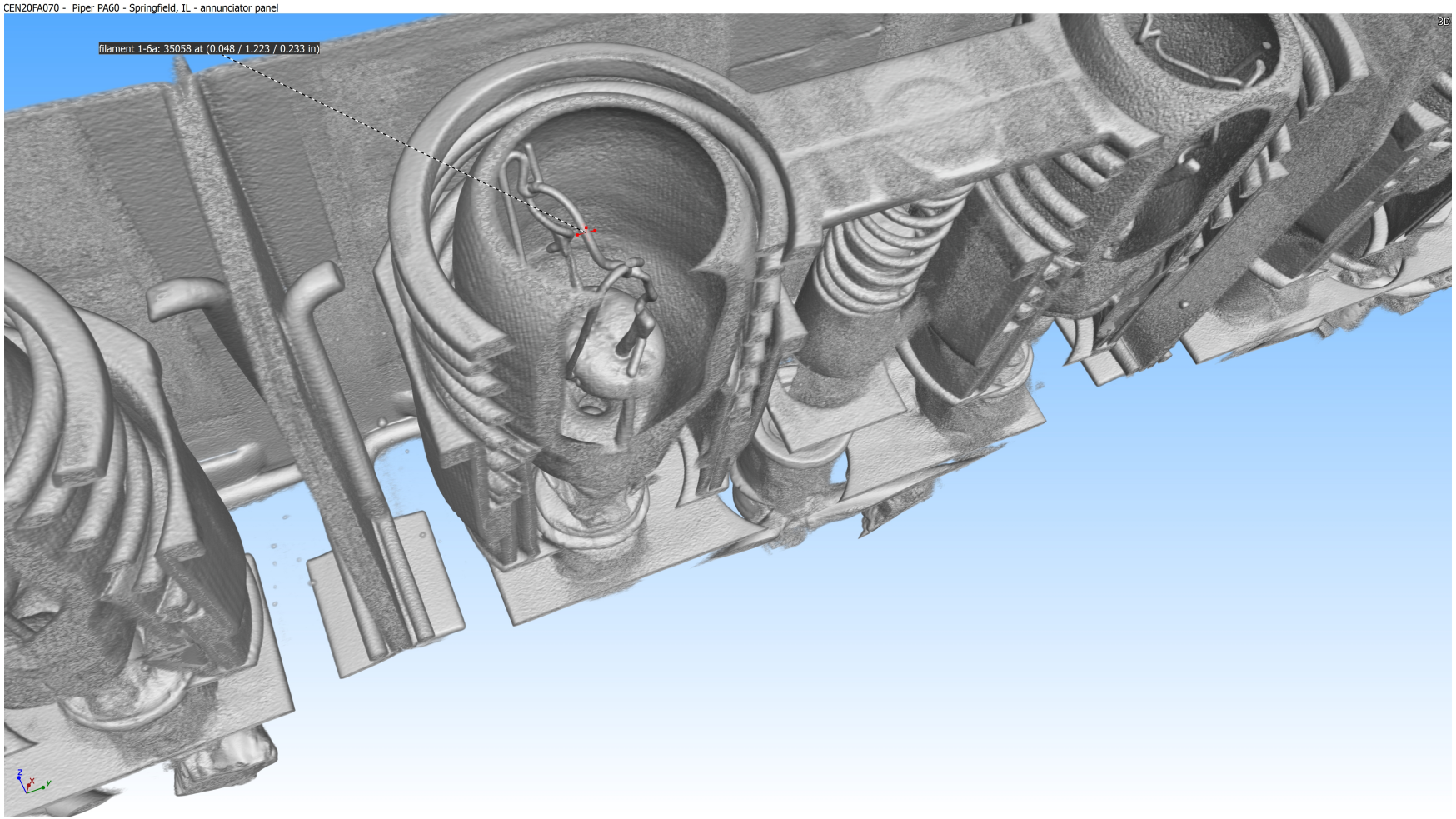


Figure 9
Filament 1-6a

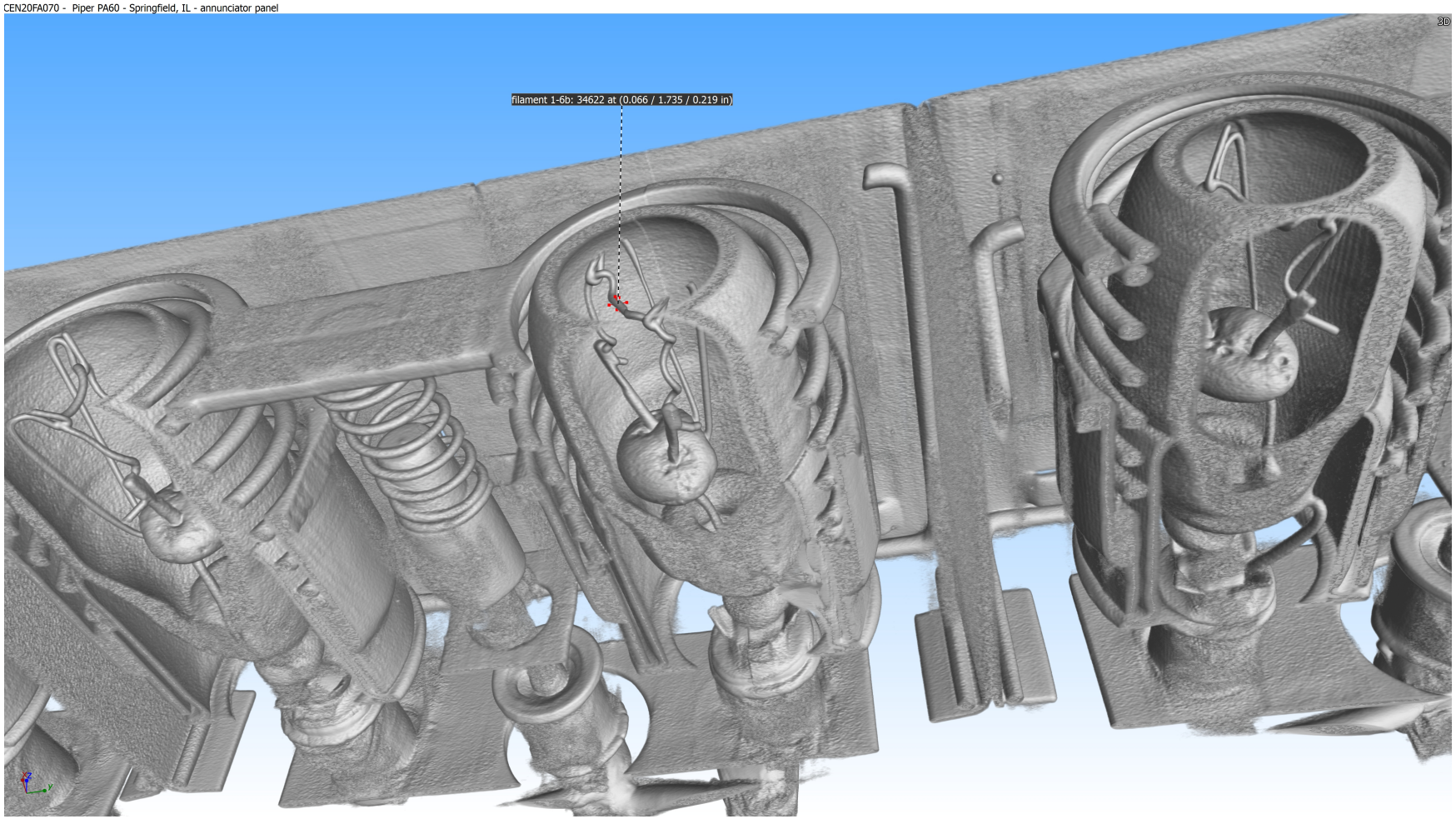


Figure 10
Filament 1-6b

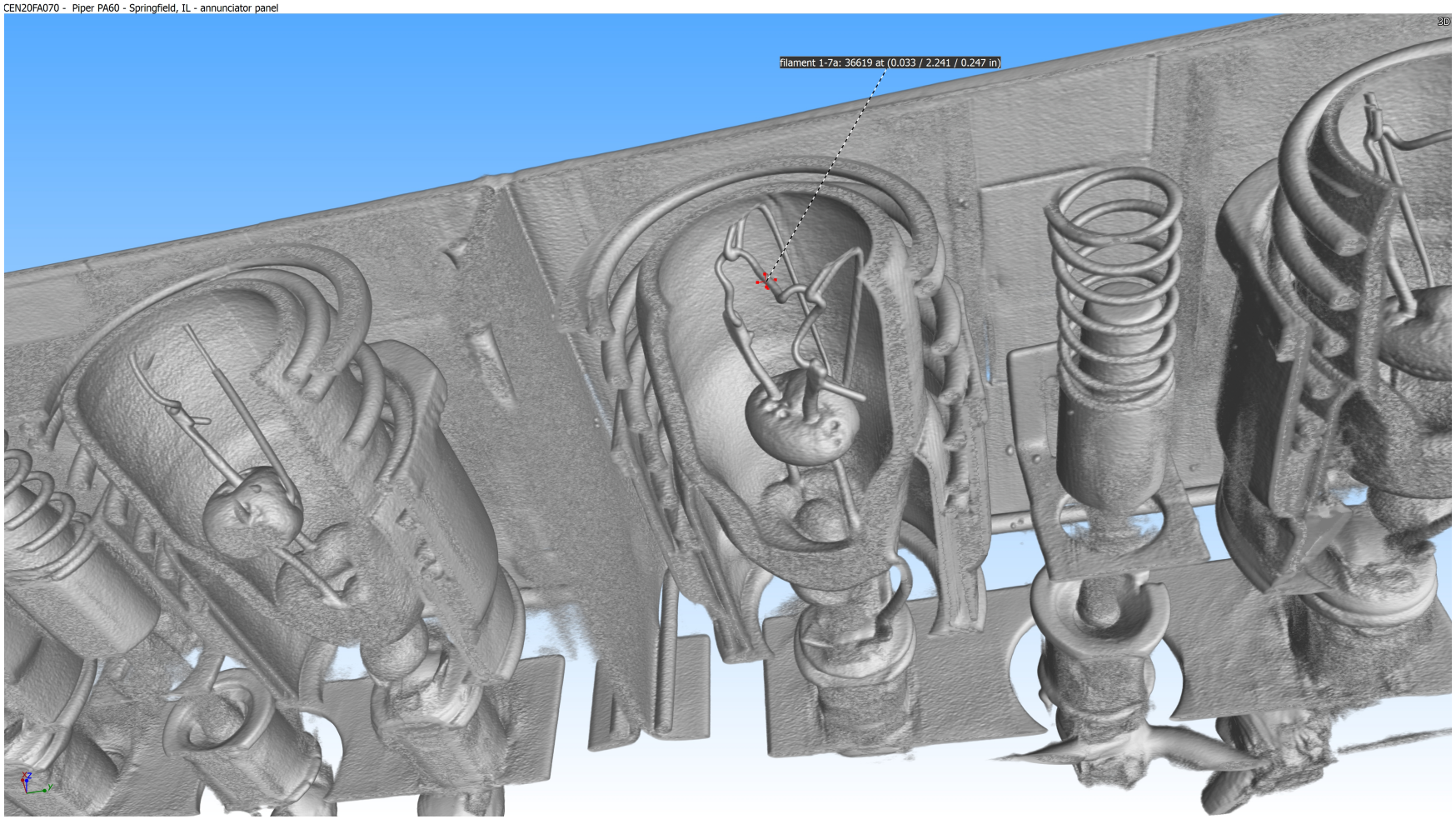


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Filament 1-7a

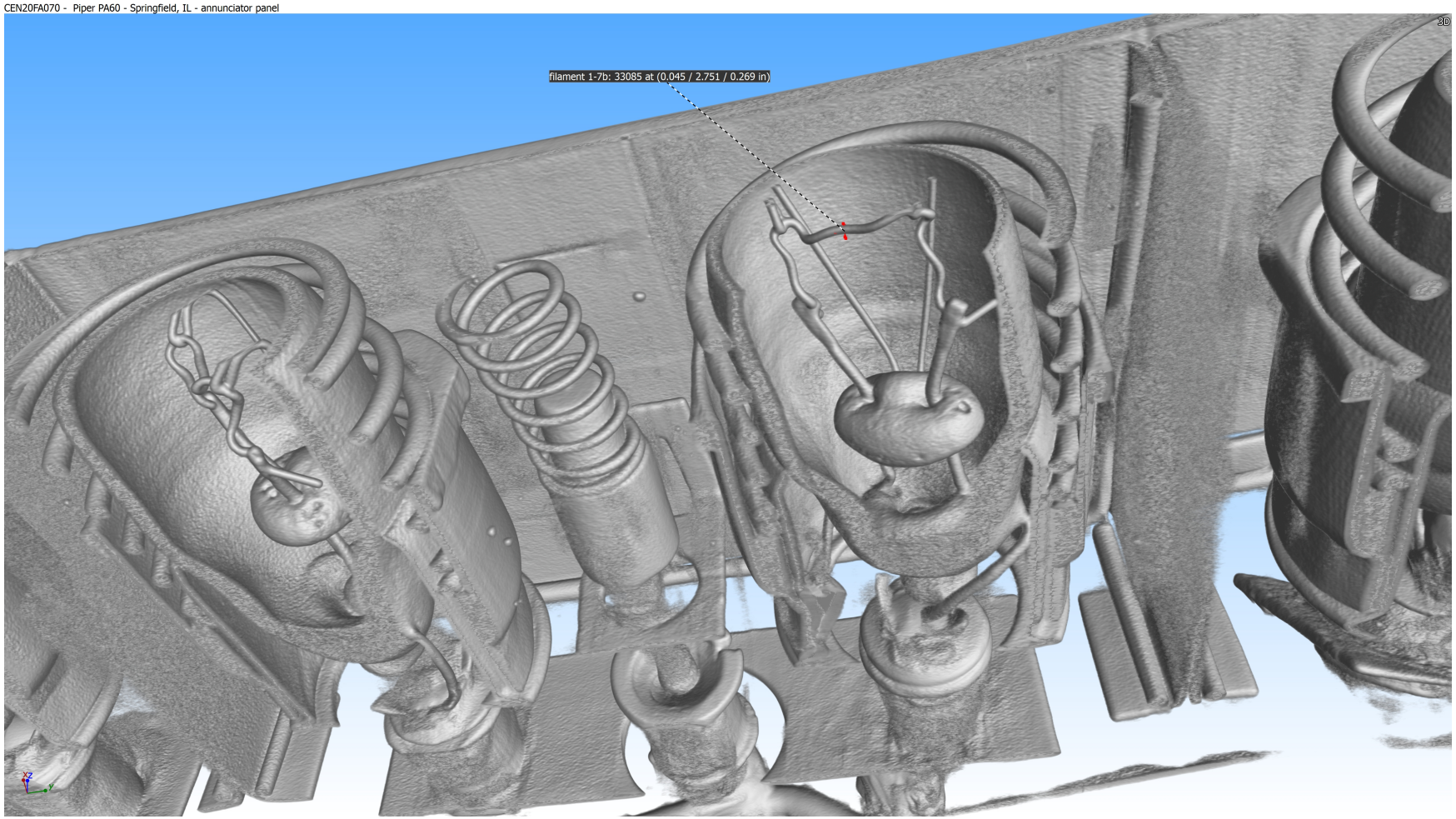


Figure 12
Filament 1-7b

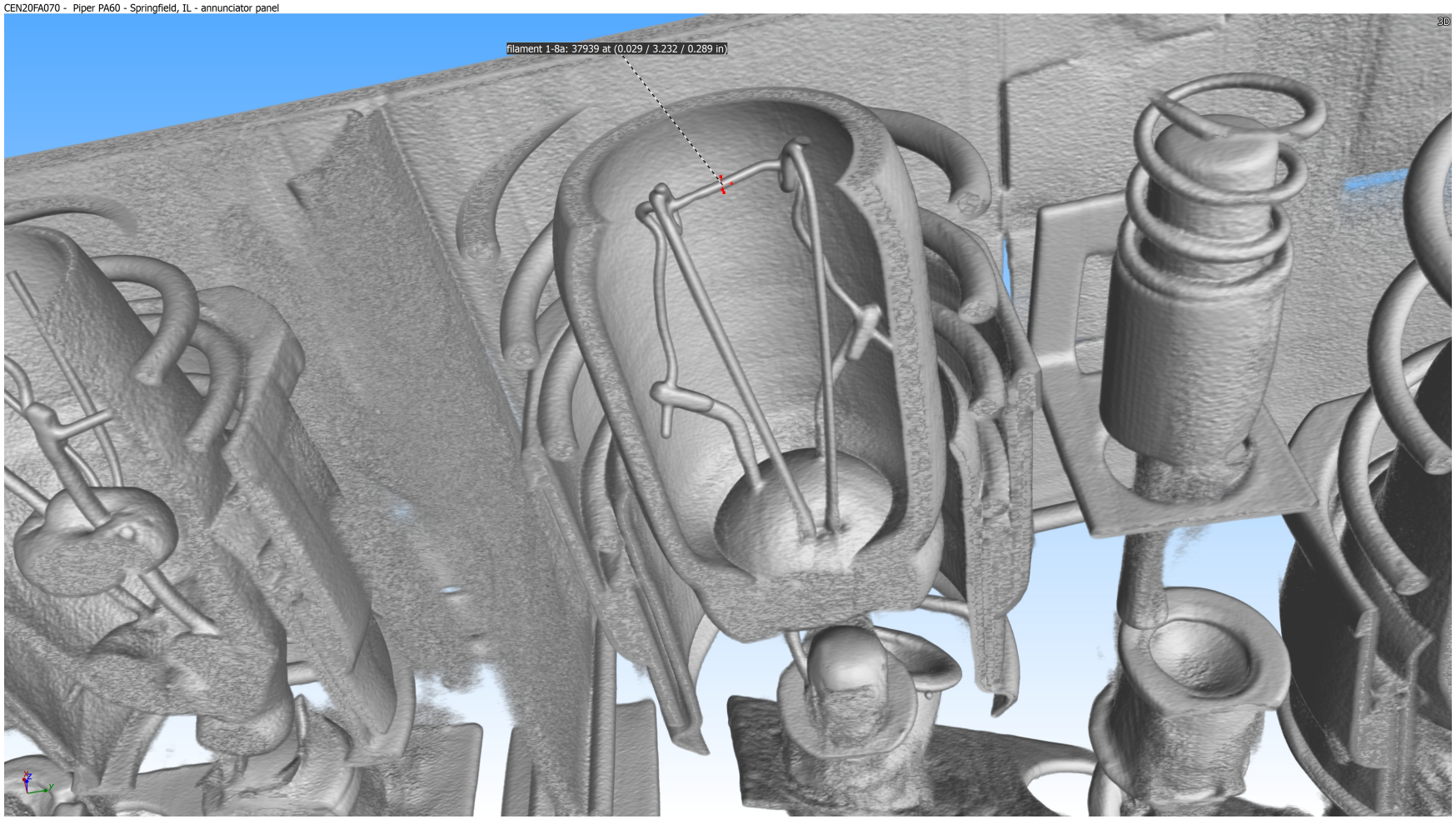


Figure 13
Filament 1-8a

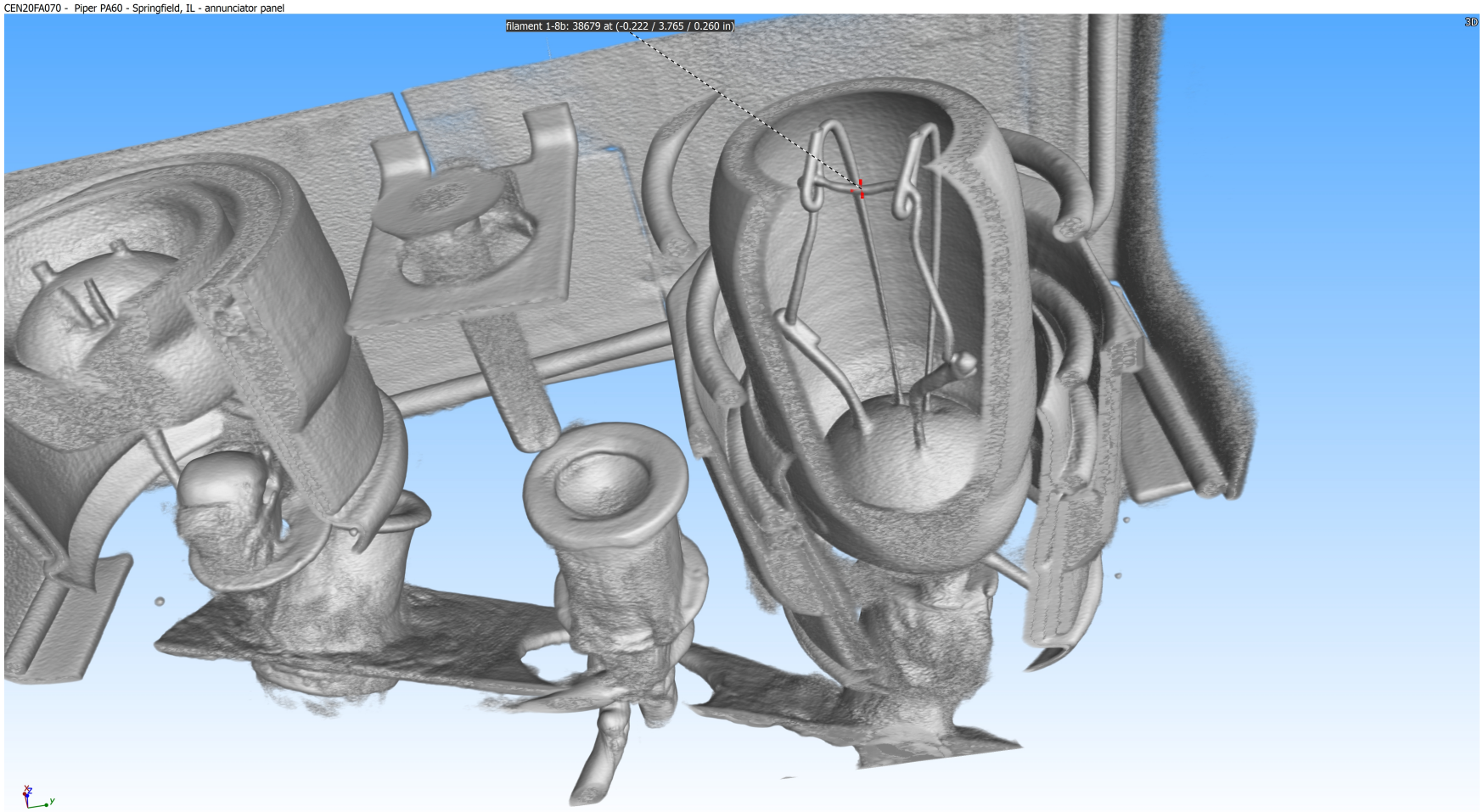


Figure 14
Filament 1-8b

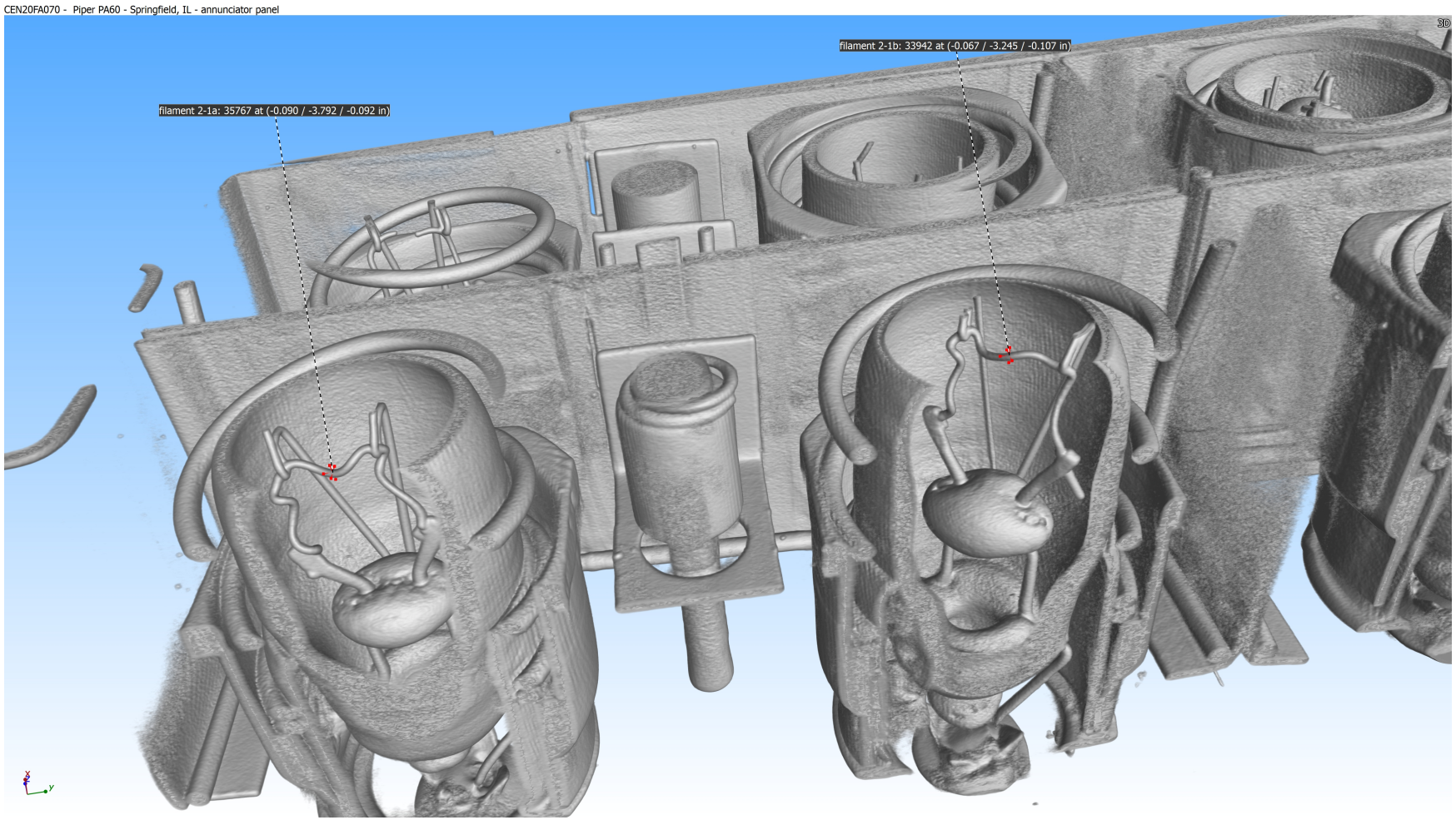


Figure 15
Filaments 2-1a and 2-1b

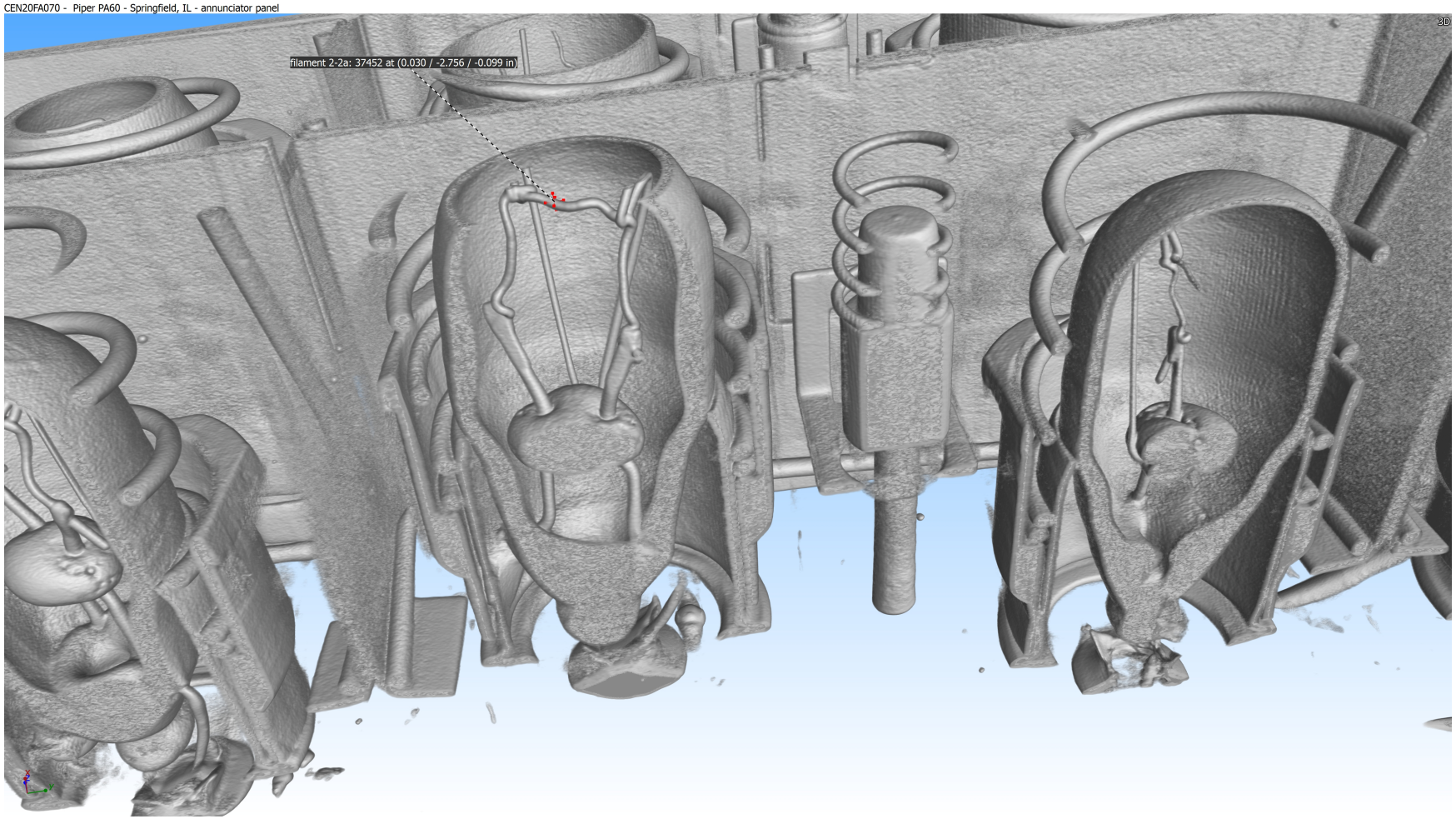


Figure 16
Filament 2-2a

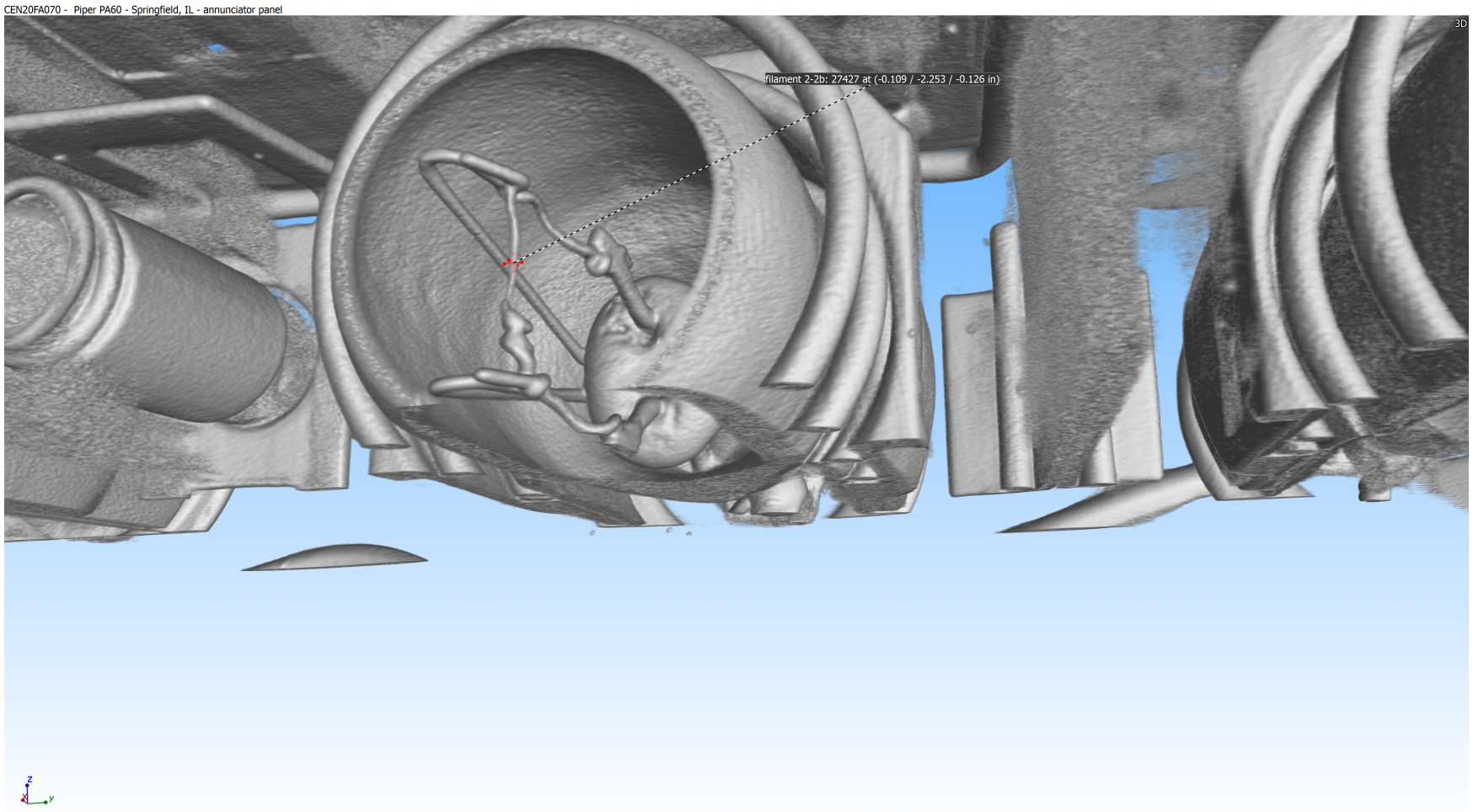


Figure 17
Filament 2-2b

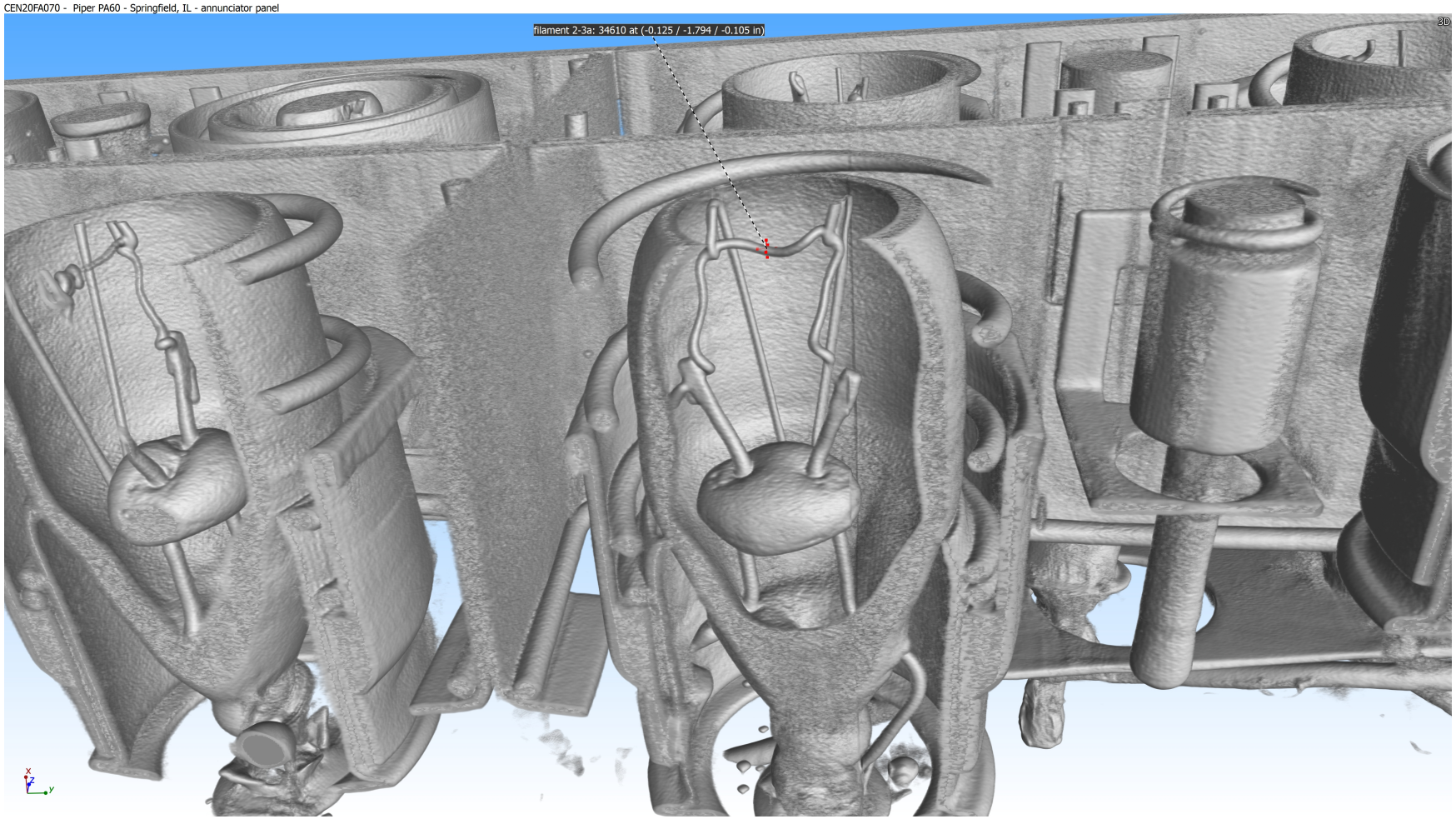


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Filament 2-3a

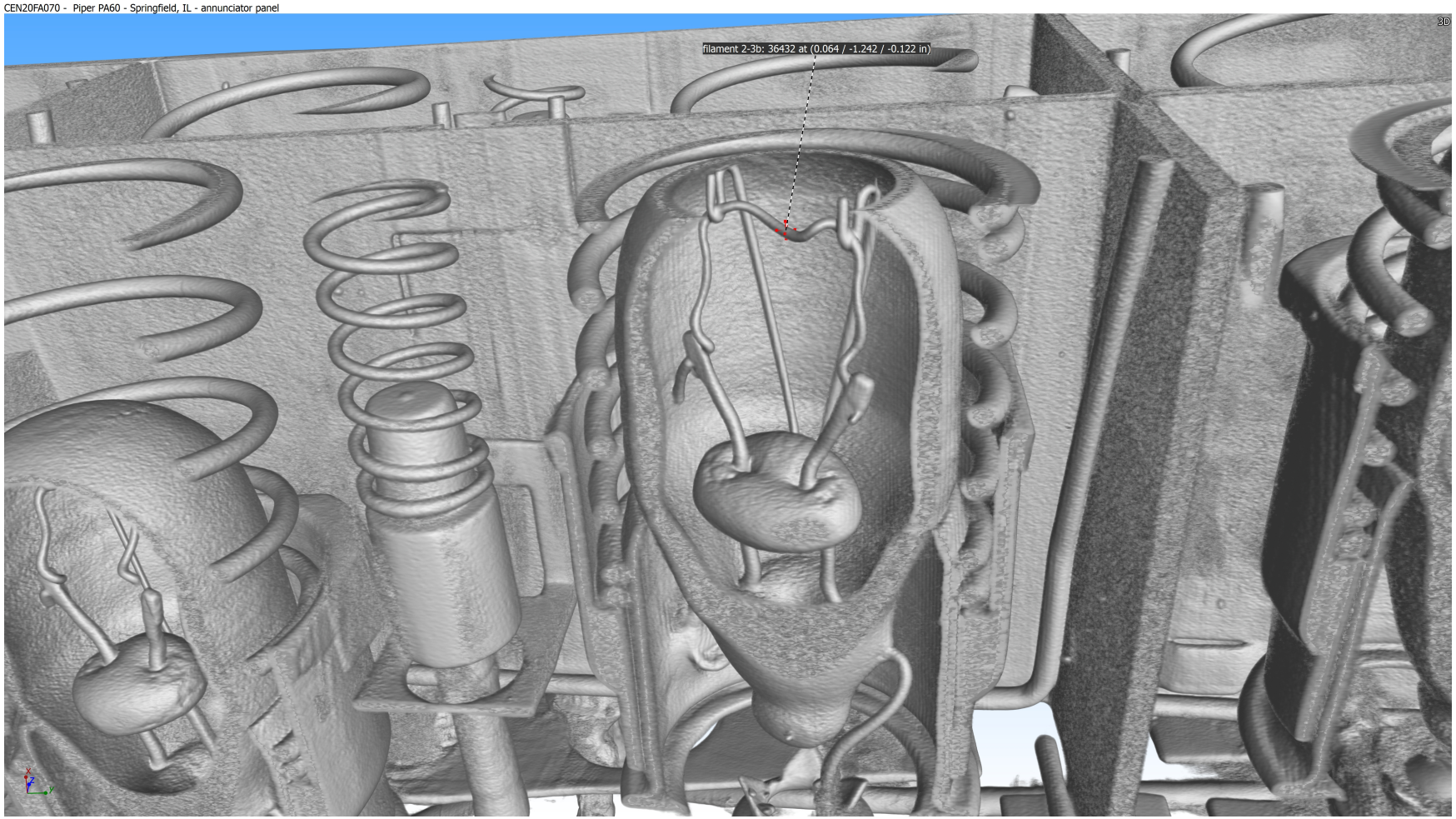


Figure 19
Filament 2-3b

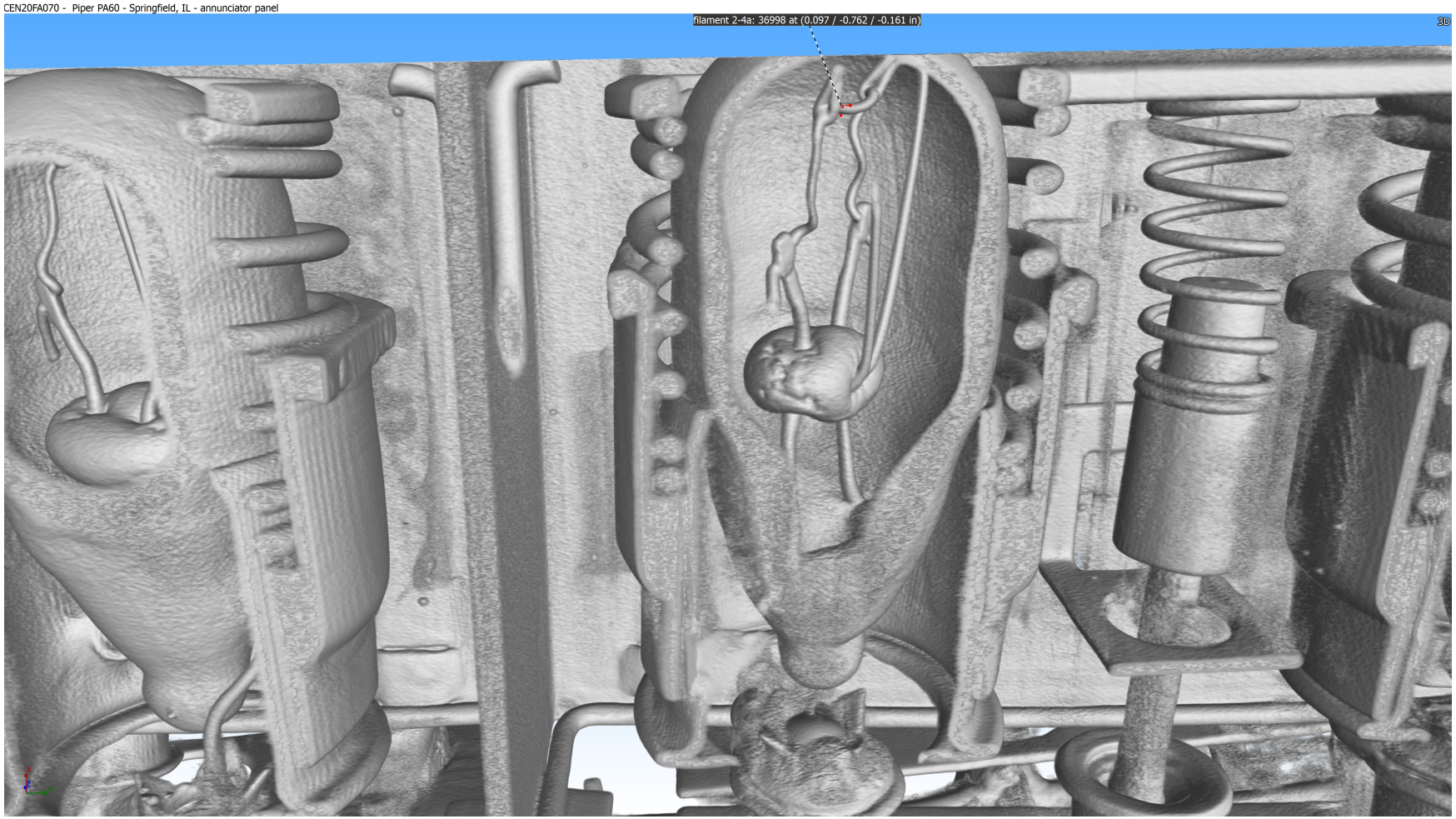


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Filament 2-4a

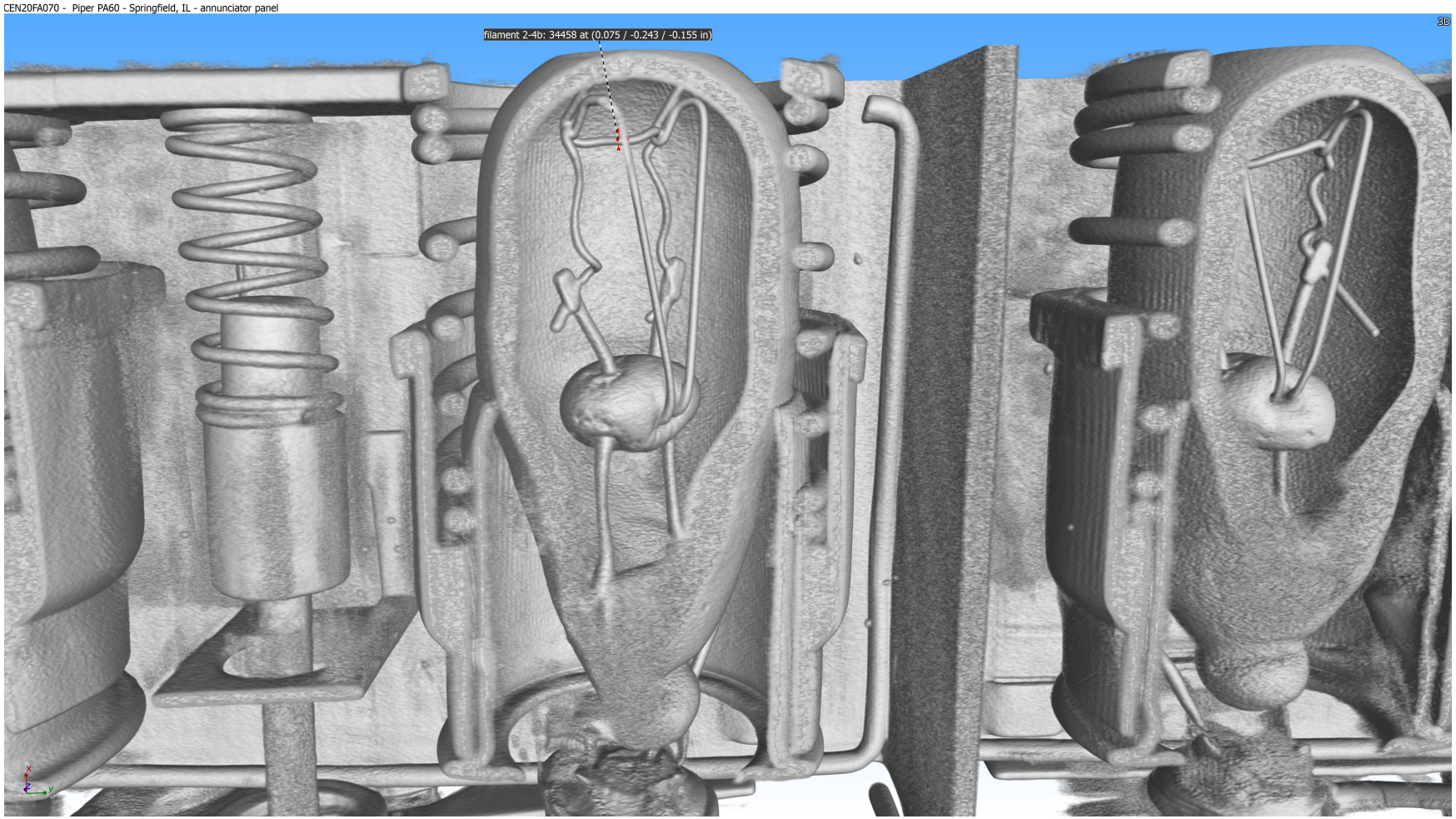


Figure 21
Filament 2-4b

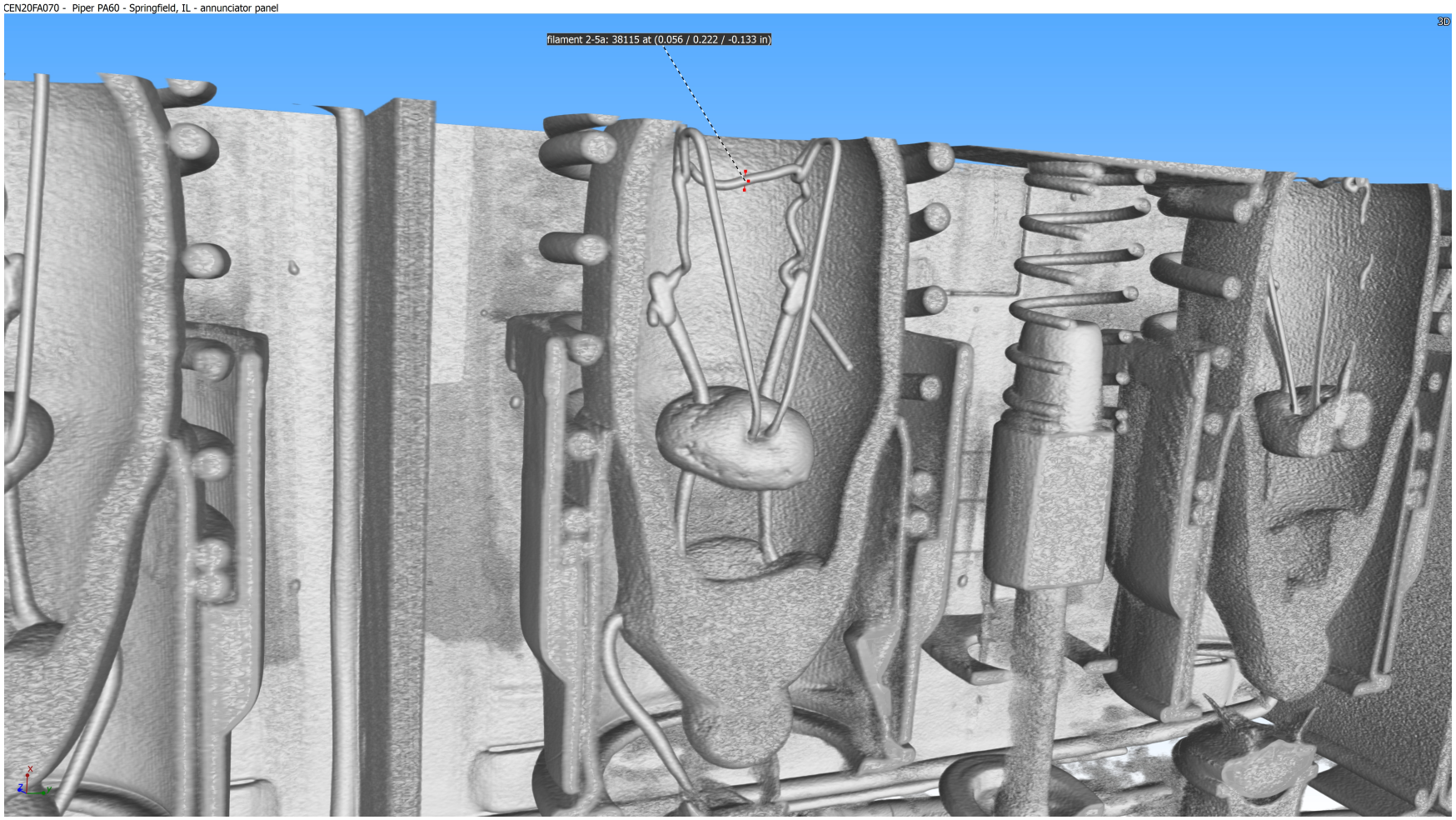


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Filament 2-5a

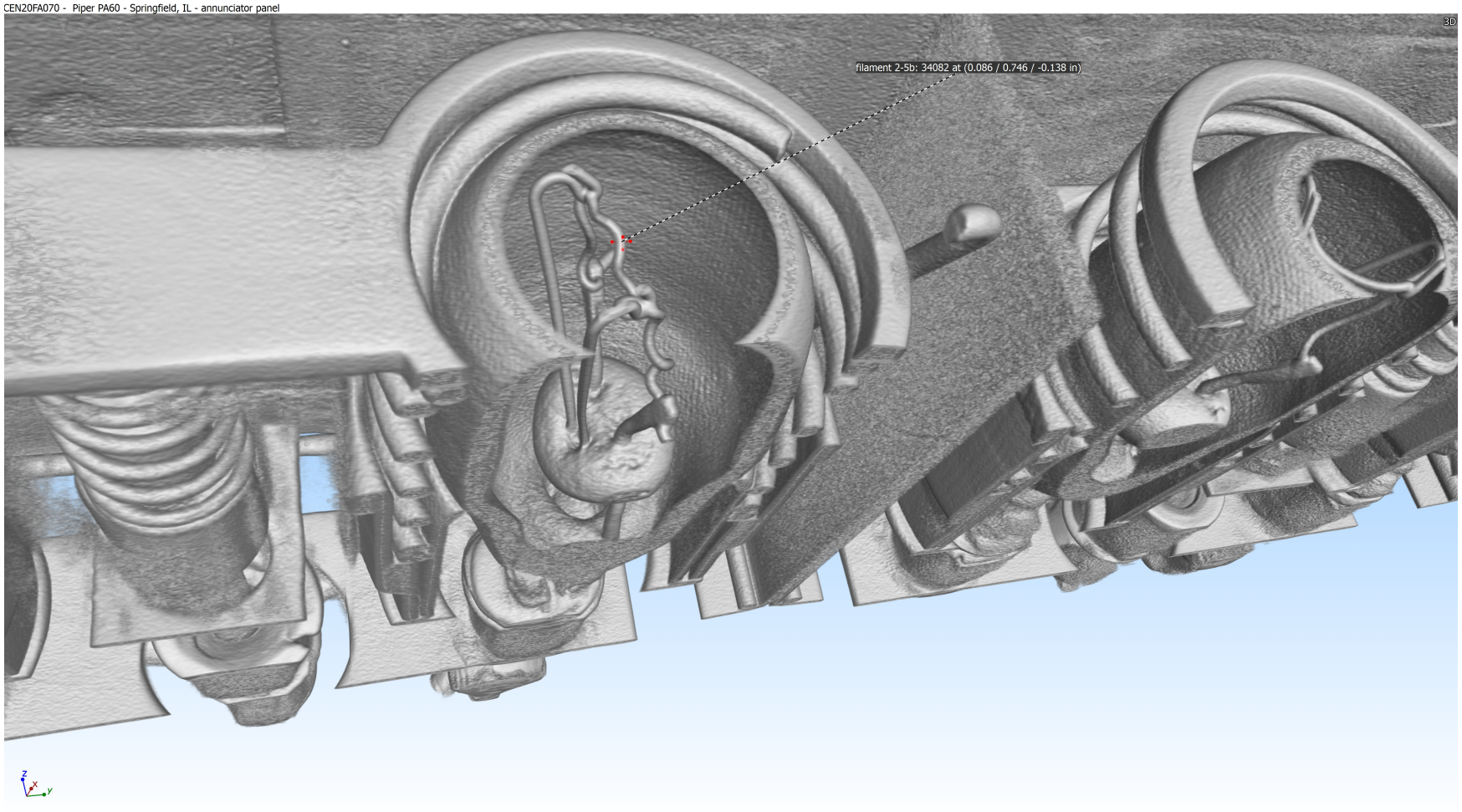


Figure 23
Filament 2-5b

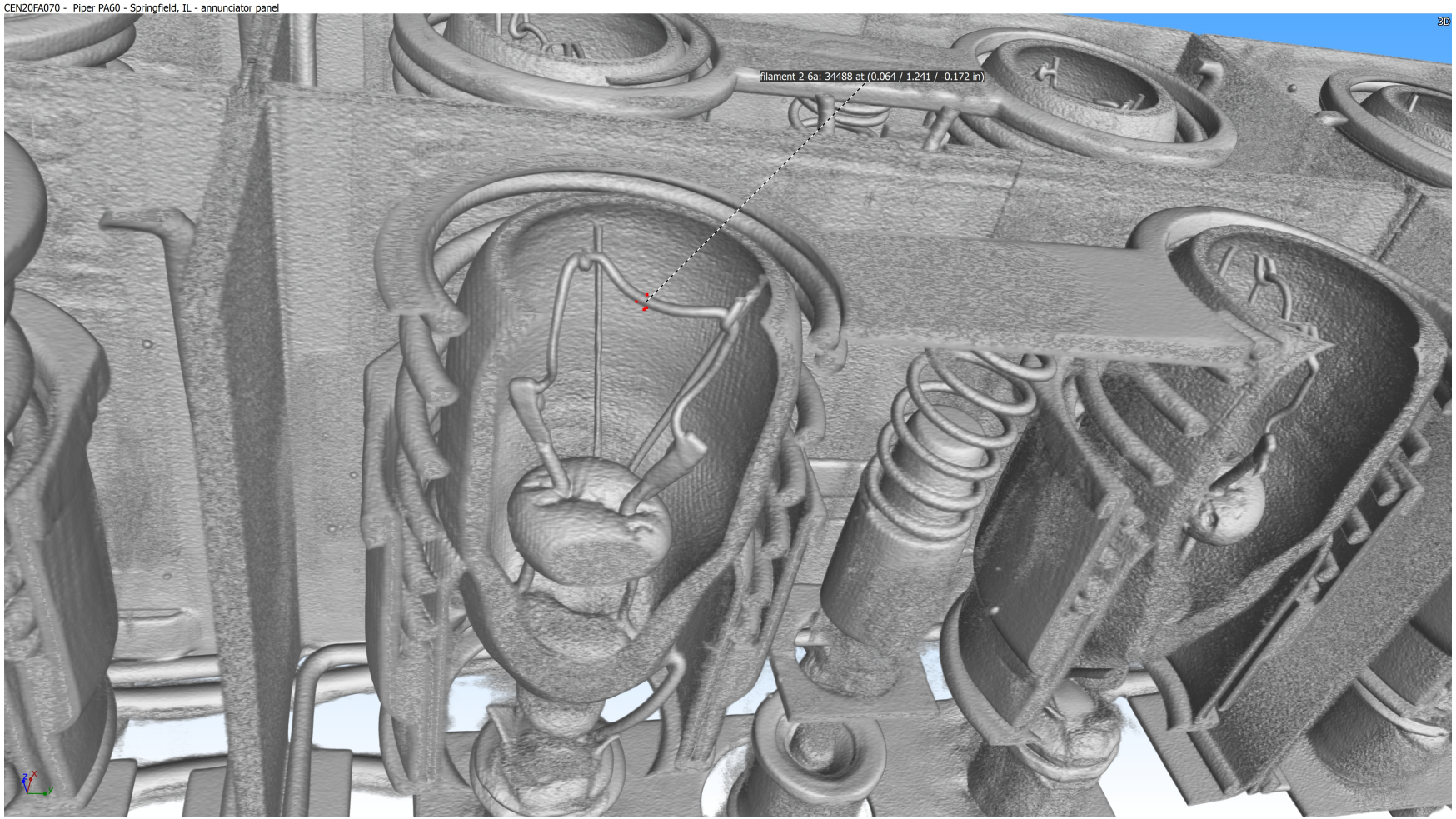


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Filament 2-6a

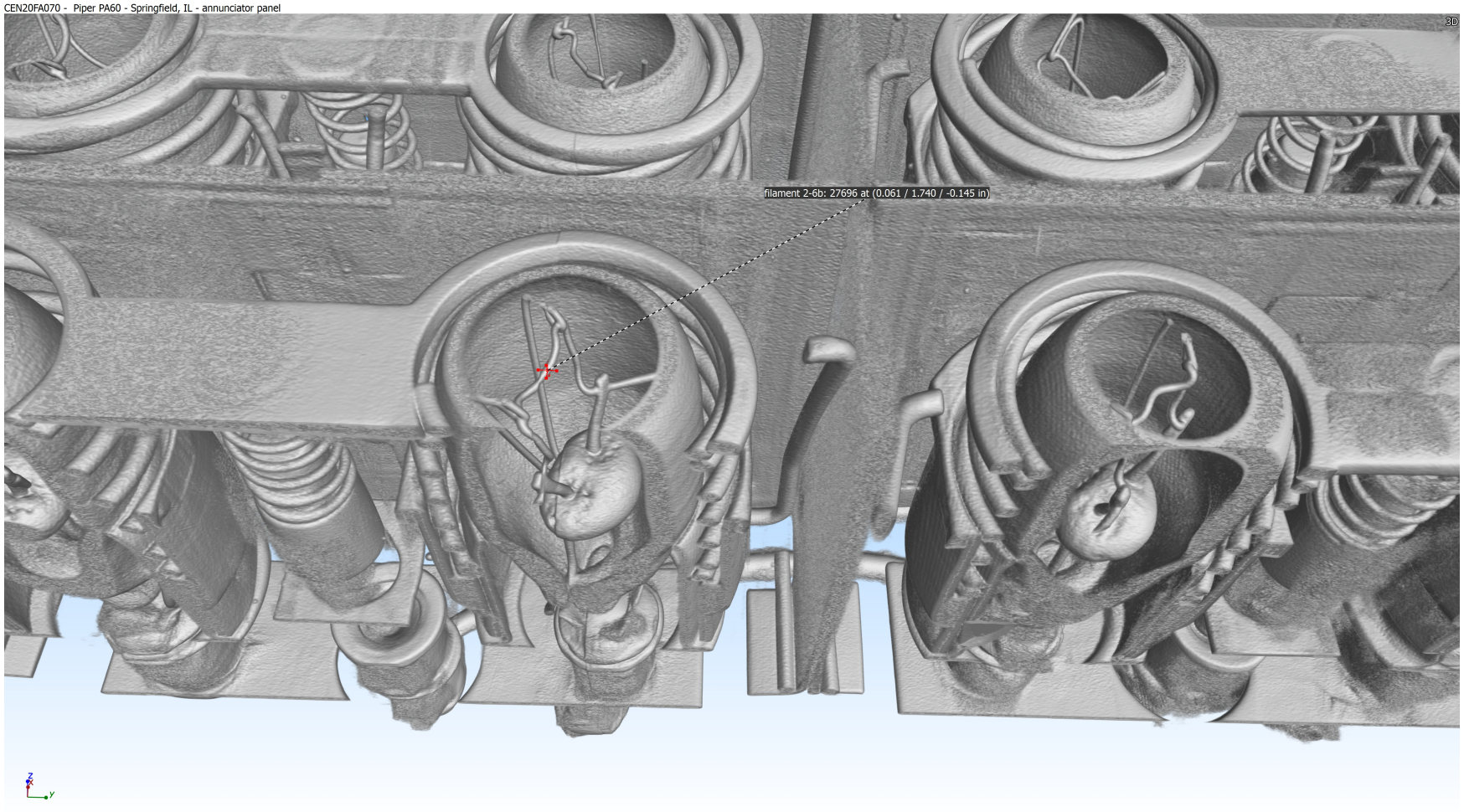


Figure 25
Filament 2-6b

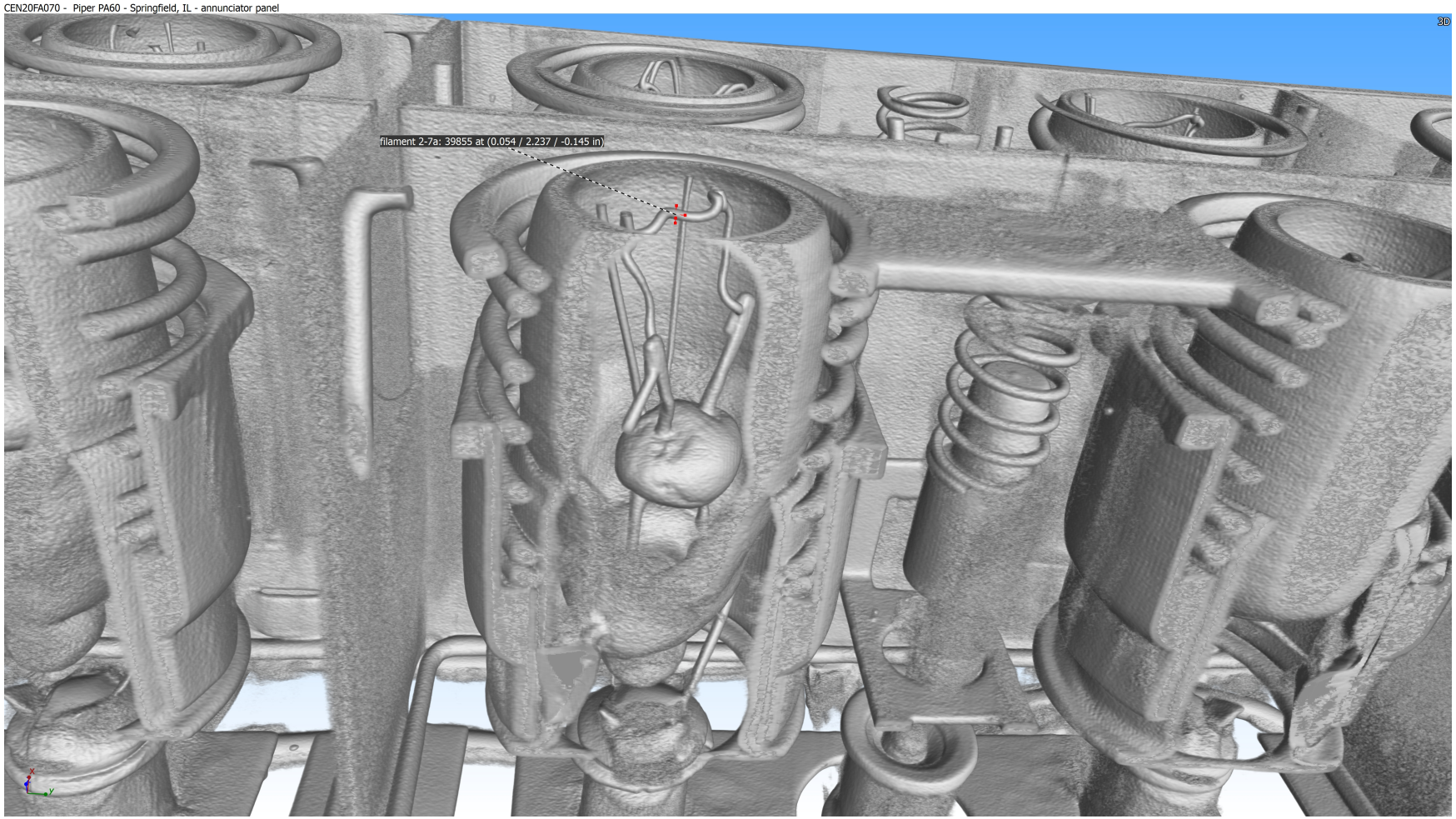


Figure 26
Filament 2-7a

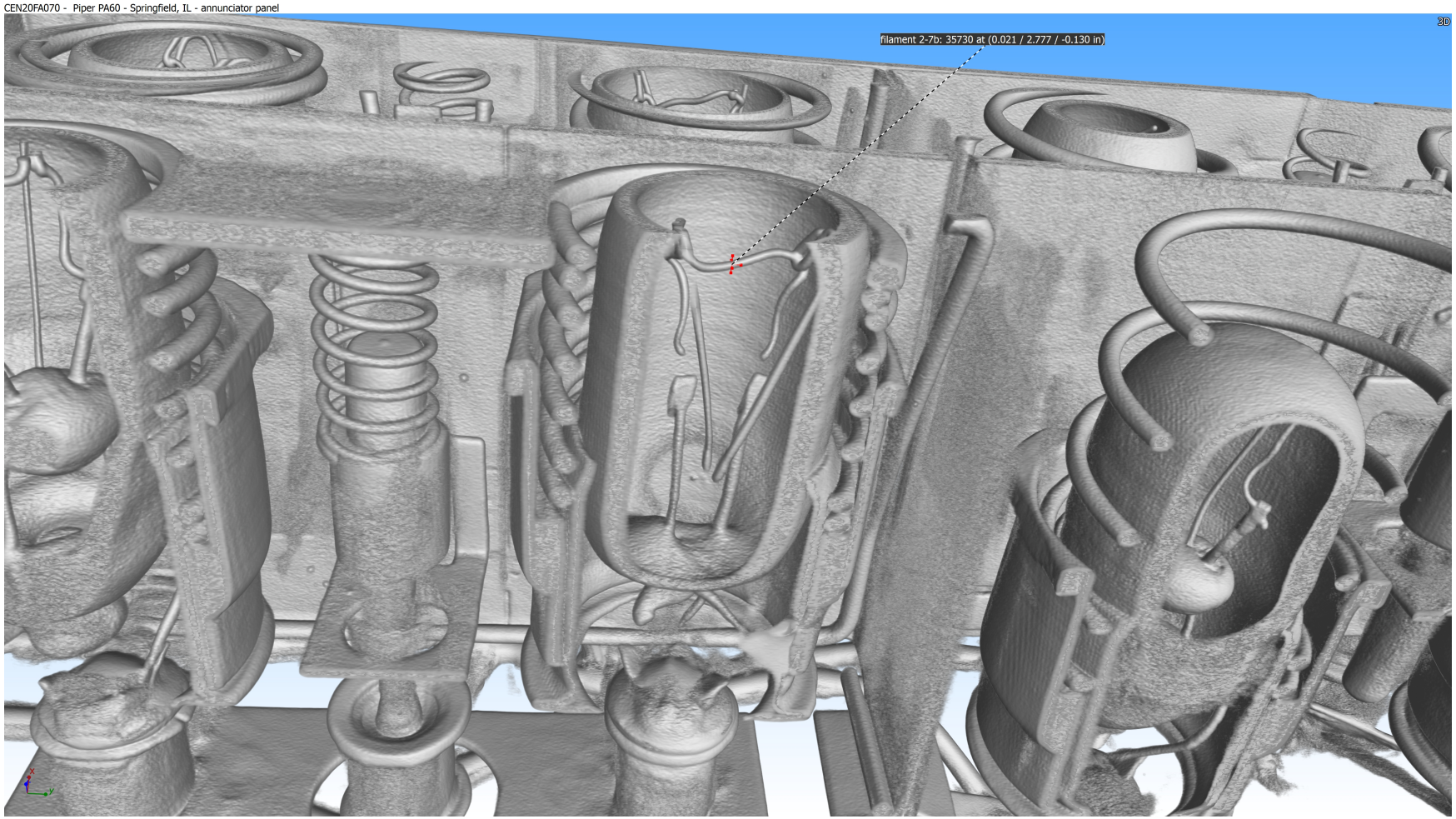


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Filament 2-7b

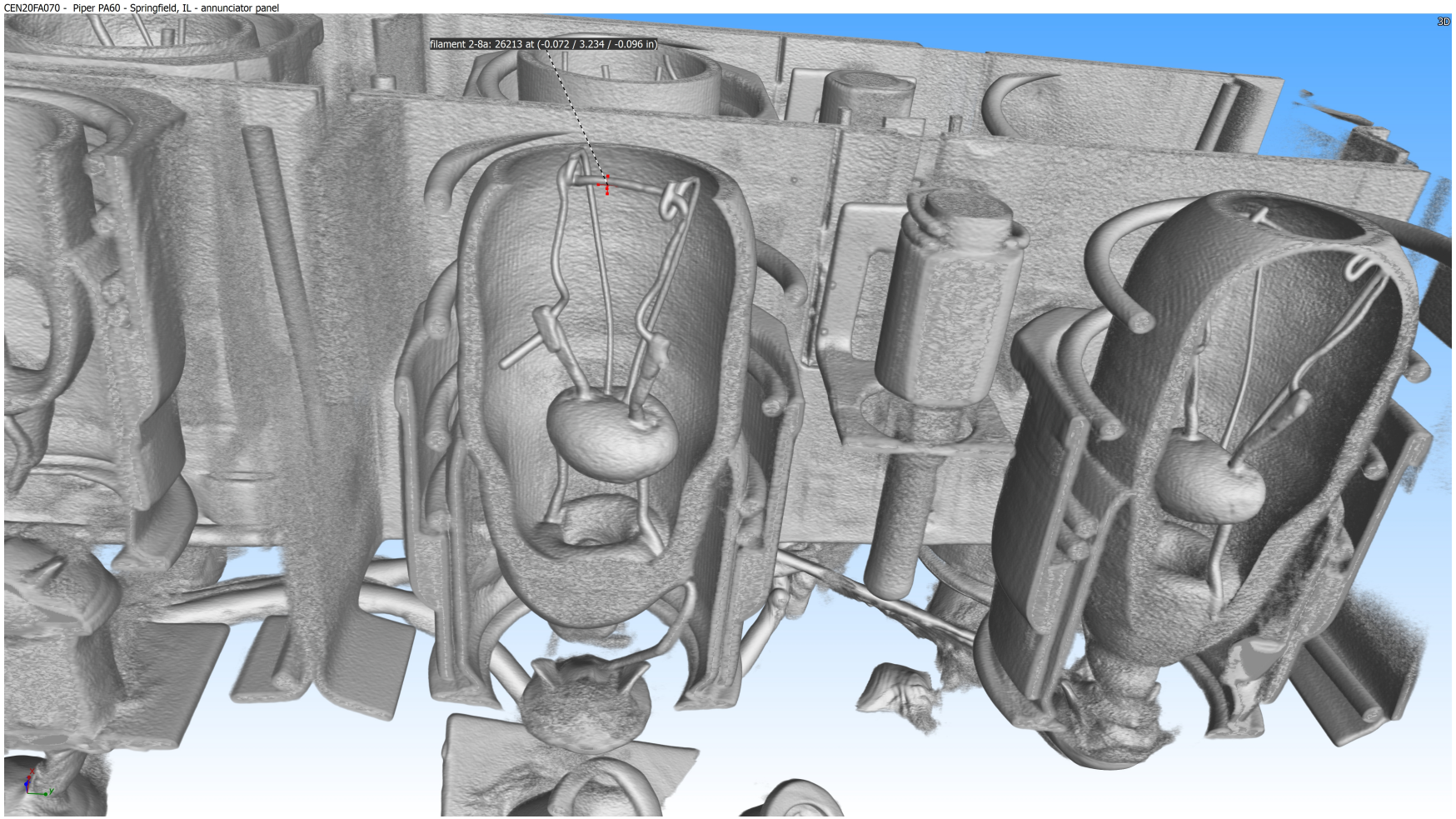


Figure 28
Filament 2-8a

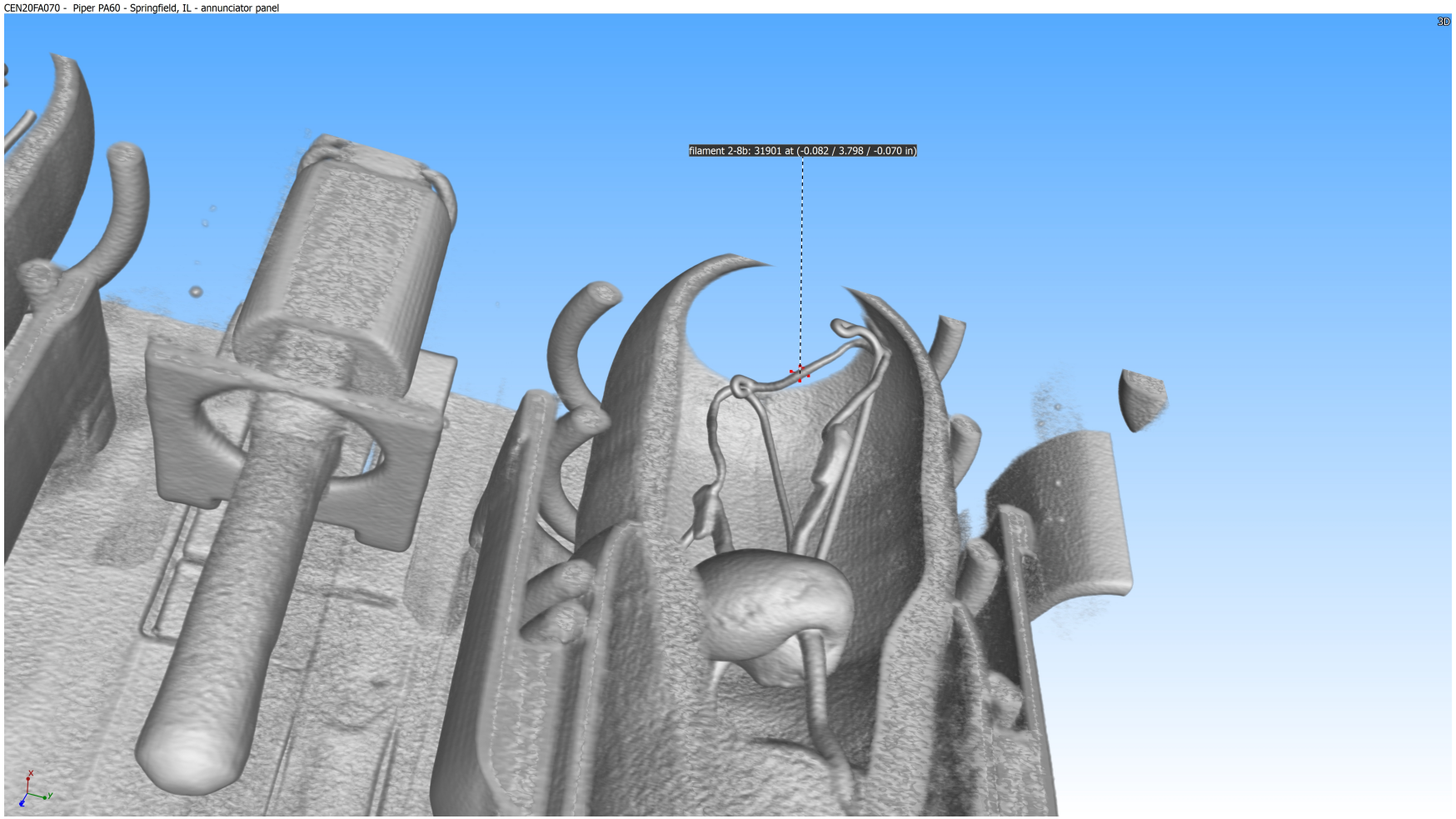


Figure 29
Filament 2-8b

Scott Warren
Lead Aerospace Engineer
(Computed Tomography Specialist)