ARIS Beam Dump Plot: 3D Modeling

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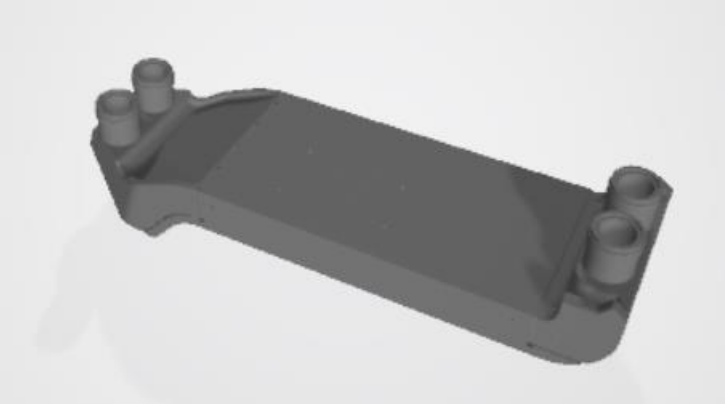
12/02/24

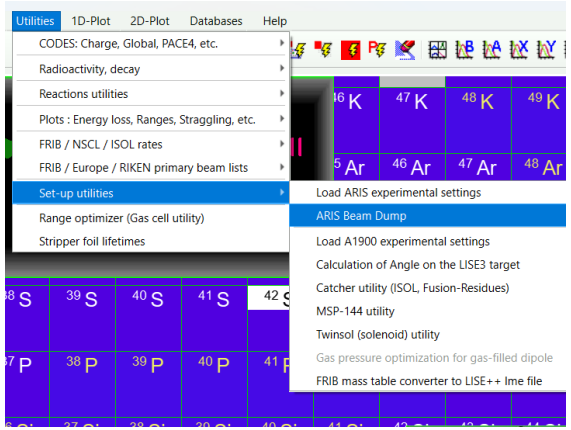
This material is based upon work supported by the U.S. Department of Energy Office of Science under Cooperative Agreement DE-SC0000661, the State of Michigan and Michigan State University. Michigan State University operates FRIB as a DOE Office of Science National User Facility in support of the mission of the Office of Nuclear Physics.

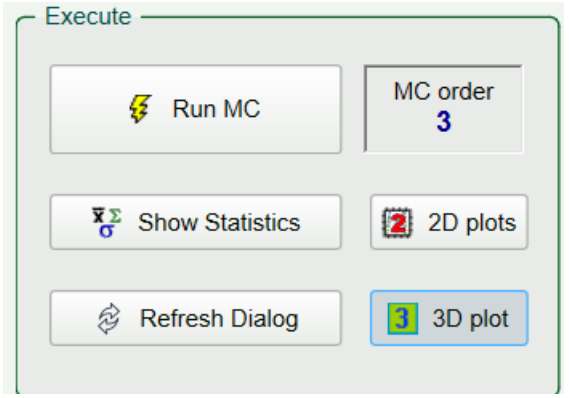
SolidWorks to ARIS Beam Dump Plot

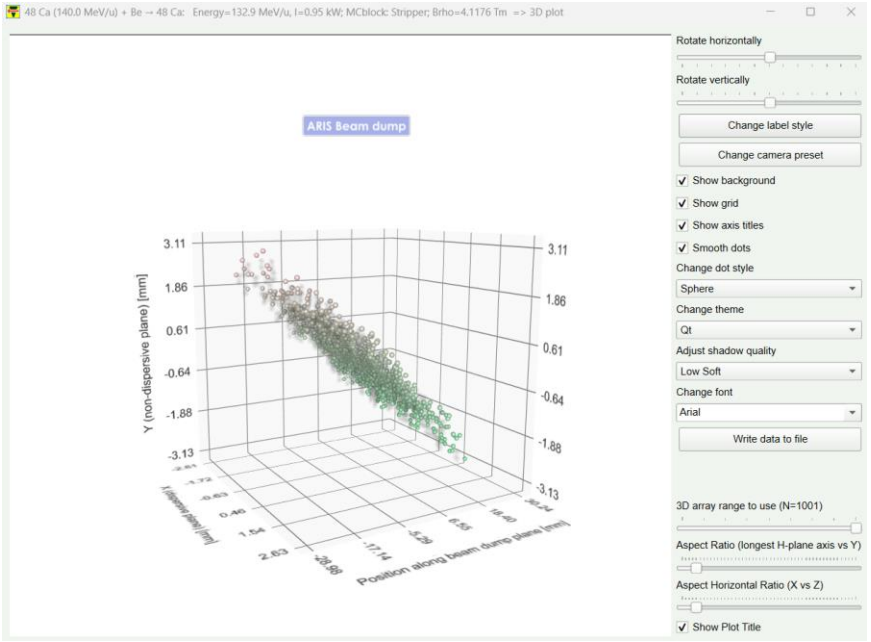


In Qt3D 5.9, QMesh supports the following formats:

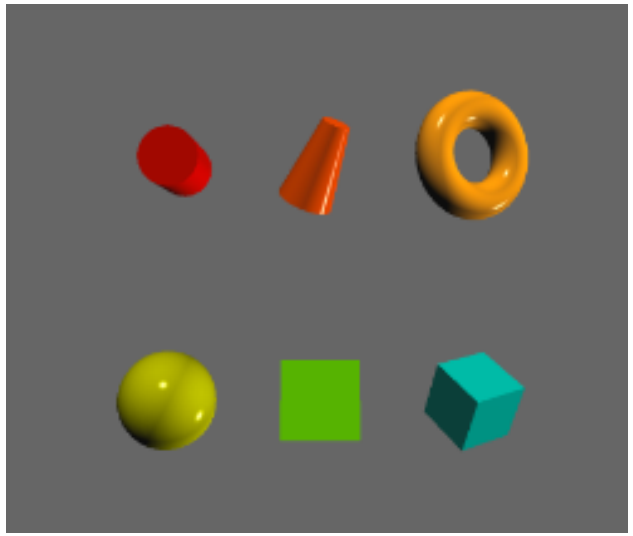
- Wavefront OBJ
- Stanford Triangle Format PLY
- STL (STereoLithography)



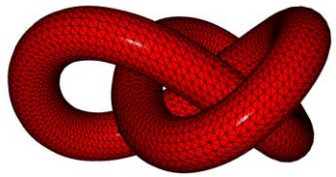




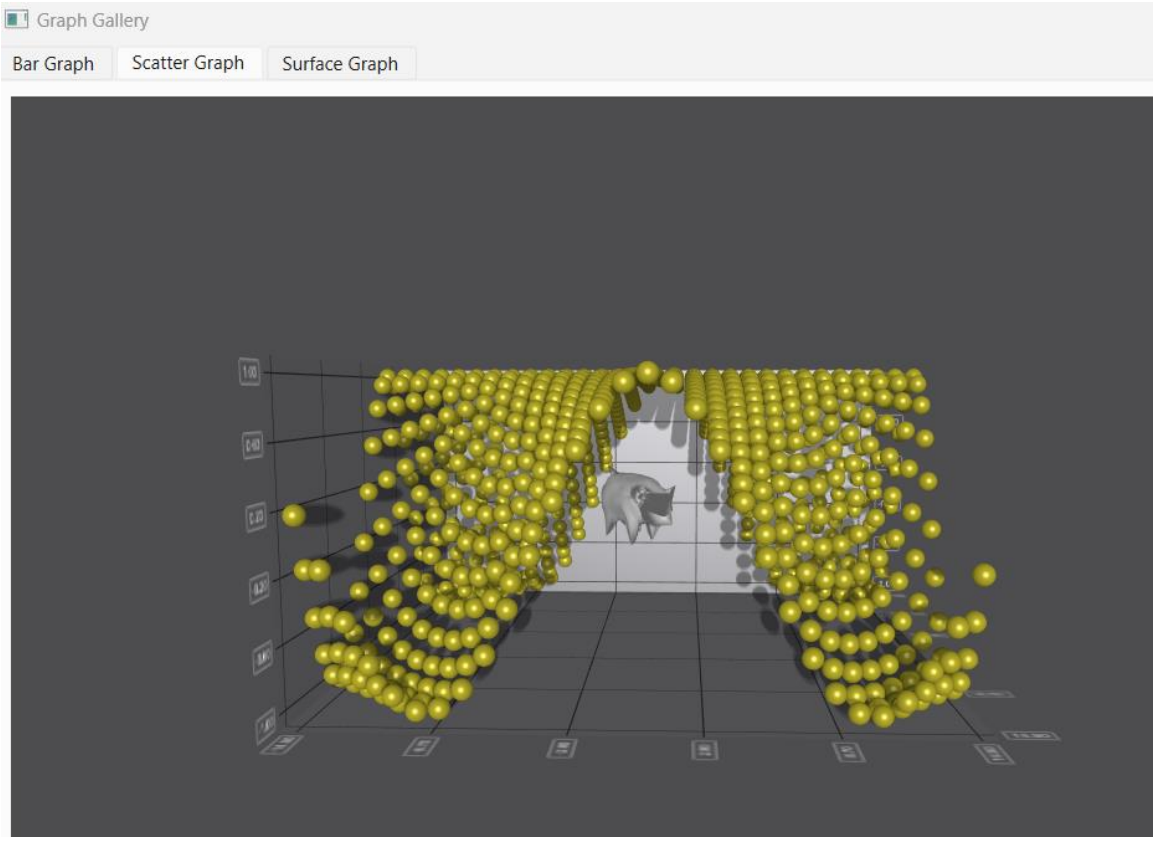
QT 3D Sample Projects



Qt's example using QPhongMaterial to set colors

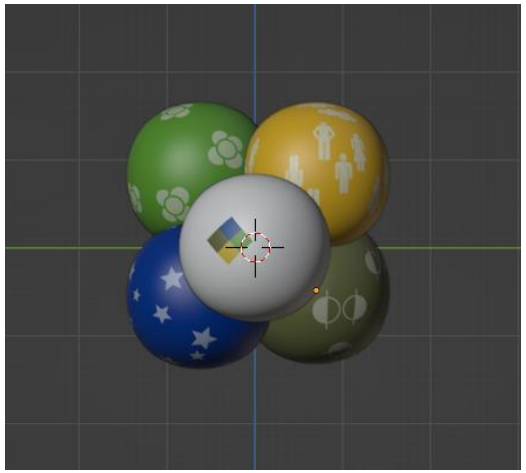


Qt's wireframe example using qml

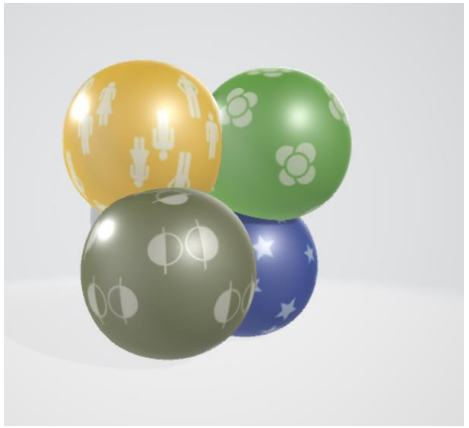


Qt's graph gallery project, with custom object imported into scatter graph similar to LISE plot.

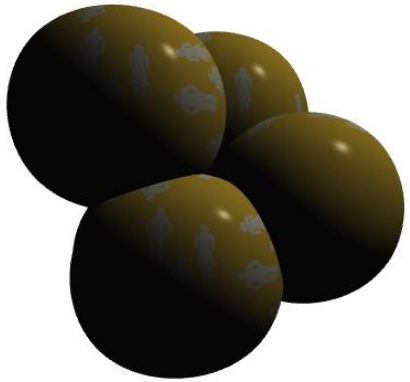
Custom Model Created to Test Materials and Texture Maps



.obj model created in Blender

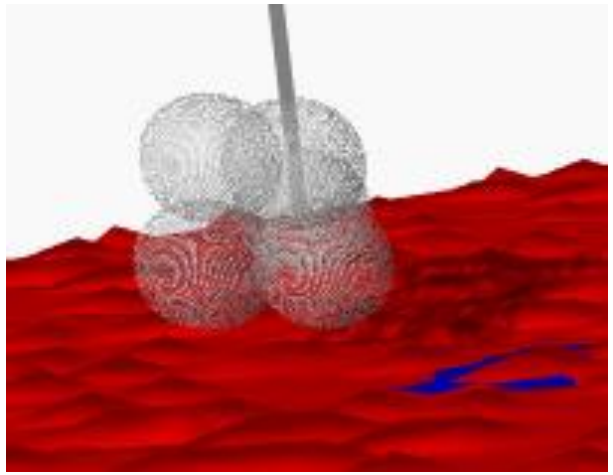


Windows 3D Viewer



Qt3D application

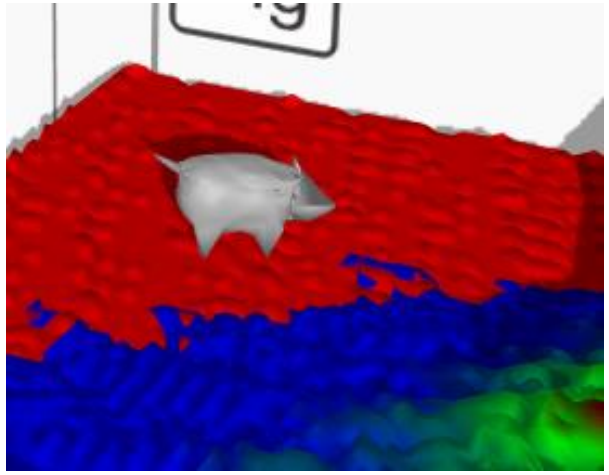
Qt3D does not natively support loading the material files directly and applying them to the specific parts of the model. This is not an automatic process.



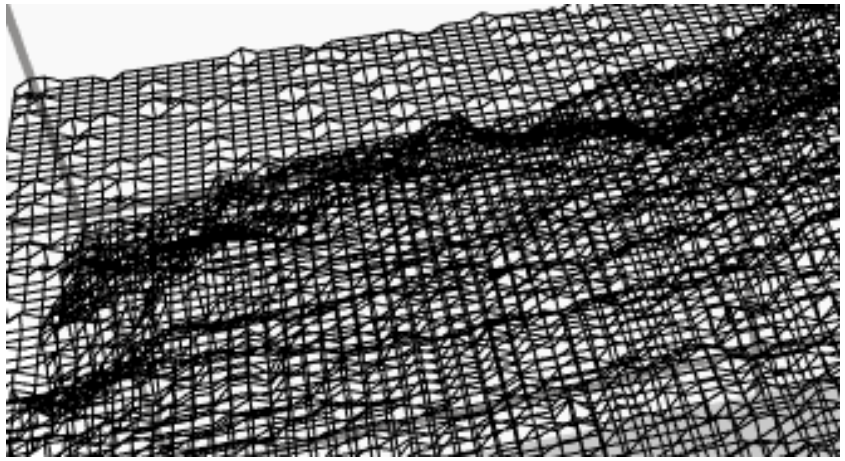
CustomItems project

Initial pass at importing object into QT application. Transparent rendering discovered to be UV map and poly count issue.

Scaling Up Method to CustomItems Project



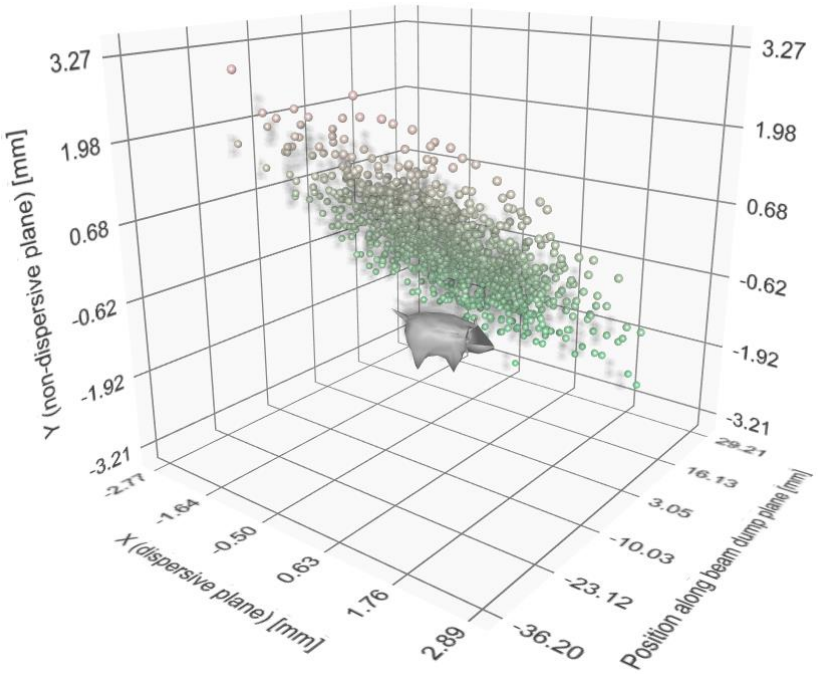
First instance of importing custom model into graph project.



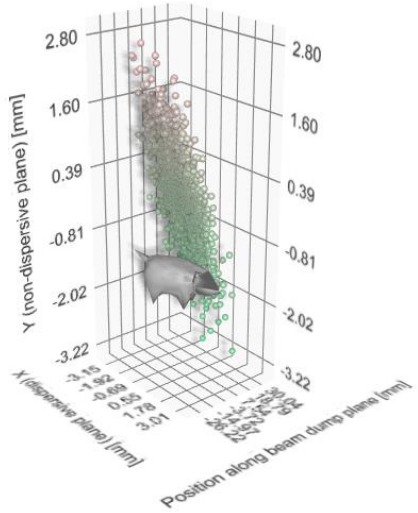
First look at issue in project:
Beam part given does not render mesh, nor produce any information.

Unwrapped UV map, so the program does not understand where to apply QT default texture.

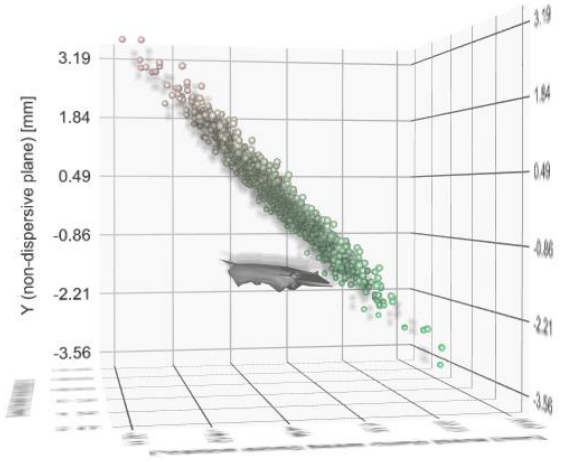
Working Importing up to LISE ARIS Beam Dump



Using custom model that initially loaded in to ensure correctly importing into LISE

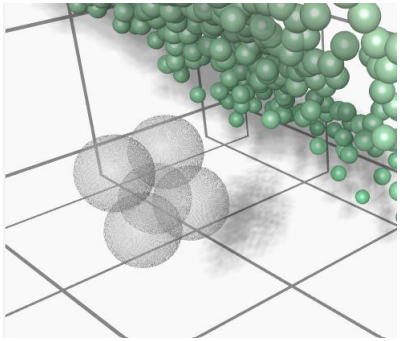


Aspect ratio difference



Vector scaling difference

Same findings with UV spheres as previous application, along with SolidWorks CAD not loading in.



Retrieving and Opening Correct File Format

c:\LISEcute\c_Plot\3D\Beampart*.*

Name	Ext
[..]	
[chrome]	
[solid]	
[stone]	
T40510-MDE-0007-2200_surfaces	IGS
T40510-MDE-0007-2200_surfaces	STEP
T40510-MDE-0007-2200_surfaces	STL
T40510-MDE-0007-2200_surfacesonecomponent	STL
T40510-MDE-0007-2200_surfaces	obj
t40510-mde-0007-2200_surfaces	wrl
T40510-MDE-0007-2200_surfaces	SLDPRT
T40510-MDE-0007-2200_surfaces	PLY
T40510-MDE-0007-2200_surfaceswireframe	STEP
T40510-MDE-0007-2200_surfaces	pdf
T40510-MDE-0007-2200_surfaces	PSD
T40510-MDE-0007-2200_surfaces	PNG
T40510-MDE-0007-2200_surfaces	JPG
T40510-MDE-0007-2200_surfacescolor	smg
T40510-MDE-0007-2200_surfaces	smg
texture	p2m
color	p2m
T40510-MDE-0007-2200_surfaces	mtl

After retrieving files formats from SolidWorks, both .fbx and the original .obj were ideal to use in Blender modeling program.

Original format issues

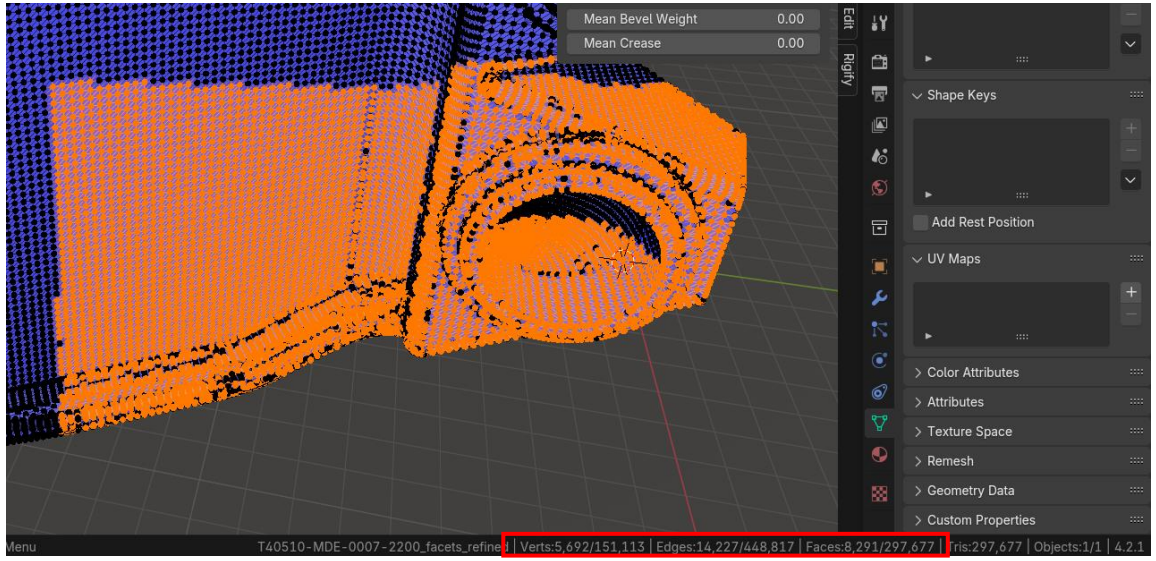
```
07:01:17: Starting c:\LISEcute\_install\LISE++.exe...
Diffuse color:  1 ,  1 ,  1 ,  1
Pig object added to the graph at position:  QVector3D(0, -1.6, 0)
The file being loaded is missing UVs and/or normals
Loading "C:/LISEcute/c_Plot/3D/T40510-MDE-0007-2200_facets_refined.obj" failed
07:01:47: c:\LISEcute\_install\LISE++.exe crashed.
```

.obj

```
07:21:27: Starting c:\LISEcute\_install\LISE++.exe...
Diffuse color:  1 ,  1 ,  1 ,  1
Mesh 0 has 184842 vertices
Mesh has normals.
Mesh does not have UV coordinates!
3D model added to the graph at position:  QVector3D(0, -1.6, 0)
07:21:55: c:\LISEcute\_install\LISE++.exe crashed.
```

.stl

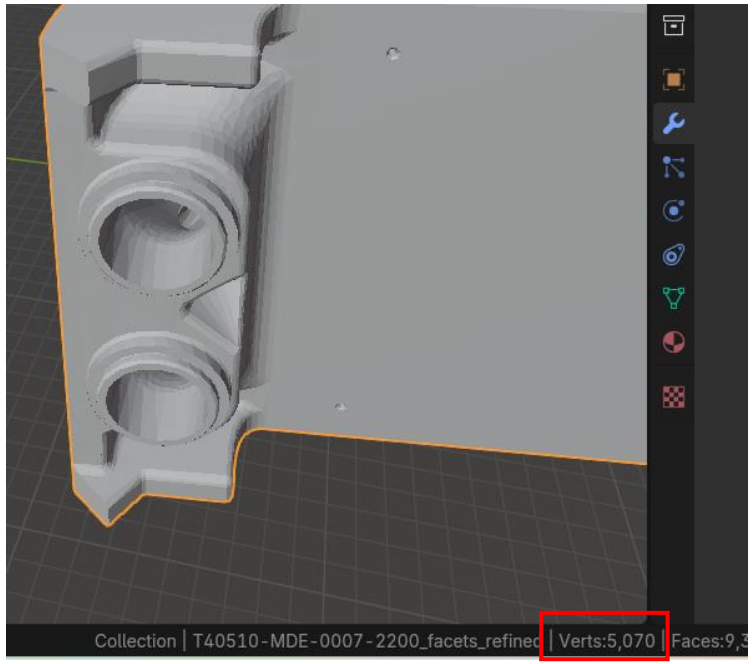
After opening .fbx in Blender



Crash reason. We'll never see it because of this

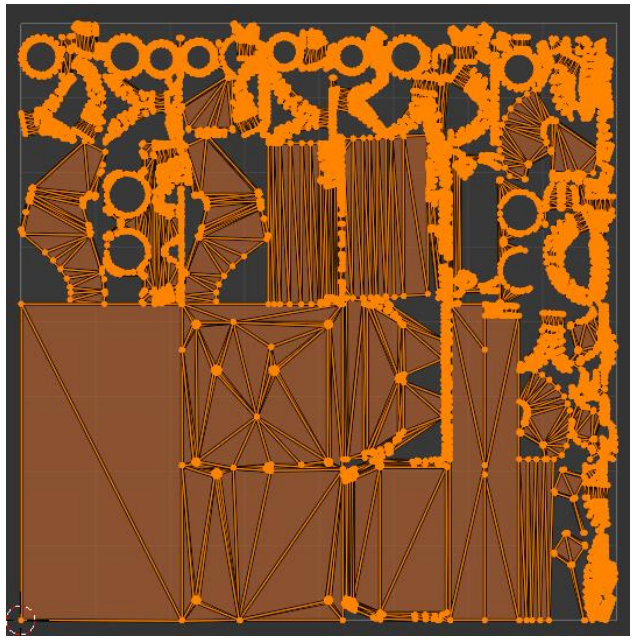
Normal map is not an issue, as blue facing outward = correct orientation and not inside out. Problem is no UV map (mesh is not unwrapped), and it doesn't unwrap easily with this high poly count. This overloads LISE and crashes.

Resolving High Poly and UV Coordinates Issues



Using the Decimate modifier on the object allows for scaling the vertices of the model down from 150,000 to 5,000, a much more reasonable count for a program to handle.

SolidWorks works in a high poly environment for precise details in creating specific parts.
Scaling the quality of the object down in Blender comes with the loss of smooth, accurate features.



Selecting the object in Blender and unwrapping it lays out all the faces of the model to allow a program to understand where to apply textures and materials to it.

This is not automatic coming from SolidWorks.

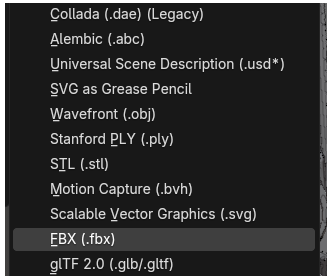
Preserving Quality Without Overloading Programs

If complete accuracy of the quality of the model is necessary for its visualization in the graph, there is a method to apply a high poly texture of the object onto a low poly version.

This process can be done in Adobe Substance 3D Painter.

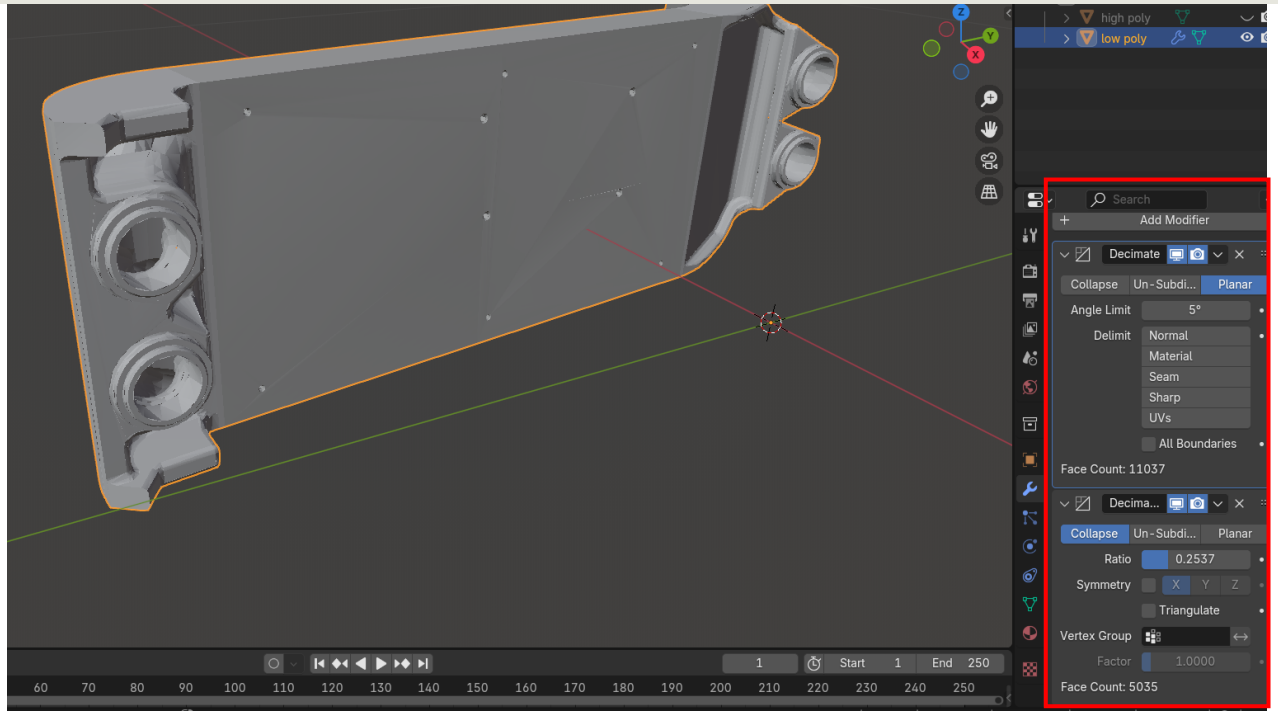
Creating High and Low Poly Versions in Blender

1. To start the process, open your object in Blender. .fbx and .obj are standard for this program.

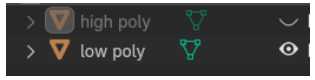


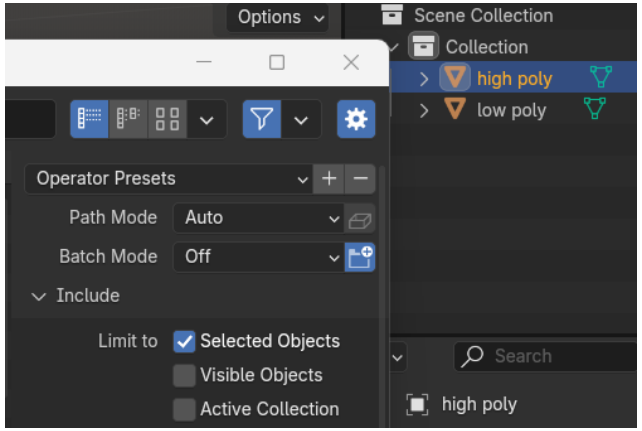
2. Duplicate the model, and name one high poly, and the other low poly. Make sure they are in the exact same location.

3. With the low poly object selected, go into the Modifiers tab, and search and apply two Decimate modifiers.



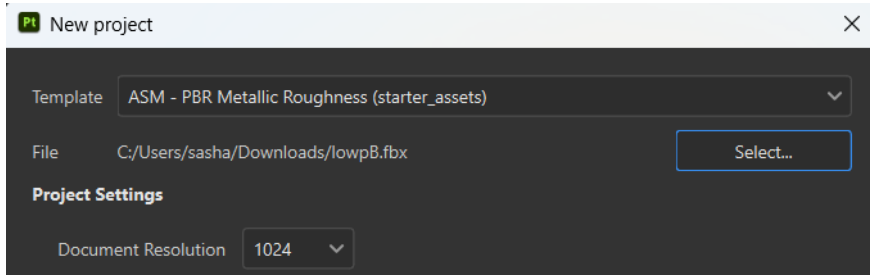
4. Make sure the one at the top is set to Planar, and then modify the Ratio of the one on the bottom to a desired face count. Hiding the high poly object makes it easier to see these changes. Ctrl-A and apply Visual Geometry to Mesh to apply these changes.



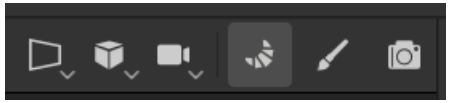


5. Export these objects as .fbx files individually by selecting one at a time, limiting your export to include only selected objects, and hitting Export FBX.

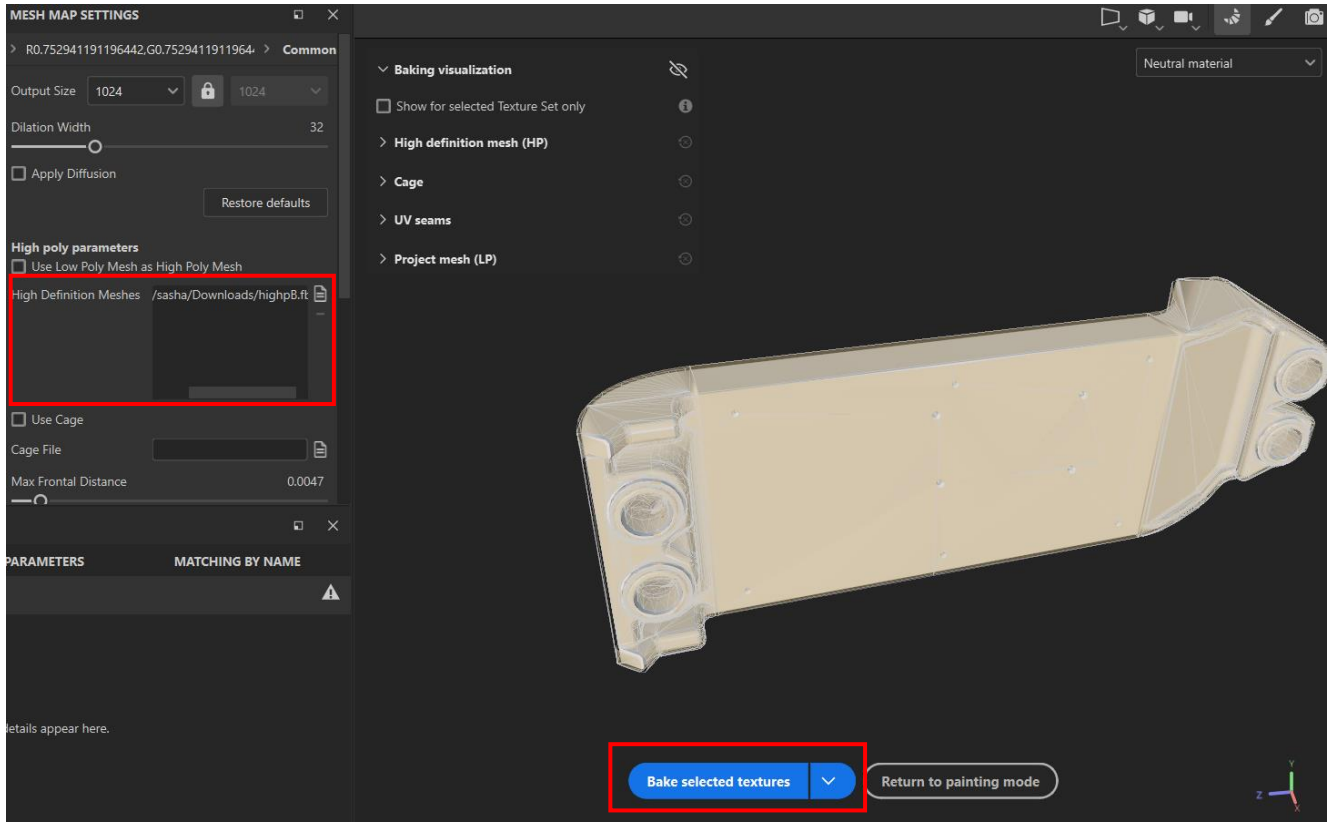
Baking High-Definition Mesh on Low Poly Object in Substance Painter



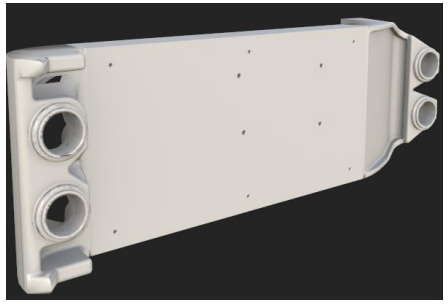
When you open up Adobe Substance 3D Painter, select New Project and open the low poly version of the model. Importing to Substance Painter automatically unwraps the UV mesh.



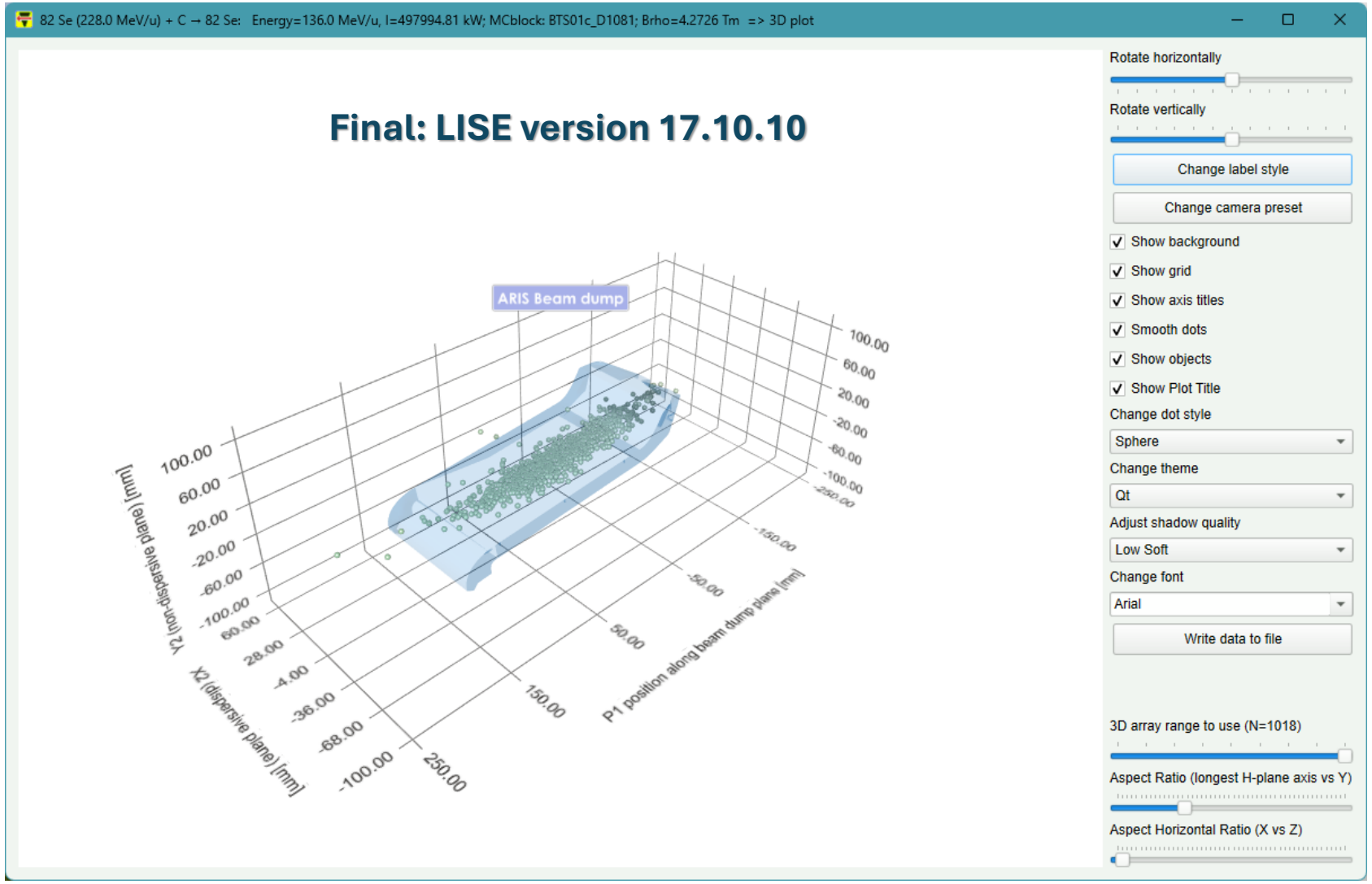
The project will automatically open in Paint mode. Switching over to Bake mode using the tabs on the top left allows you to alter the mesh texture with the higher poly model.

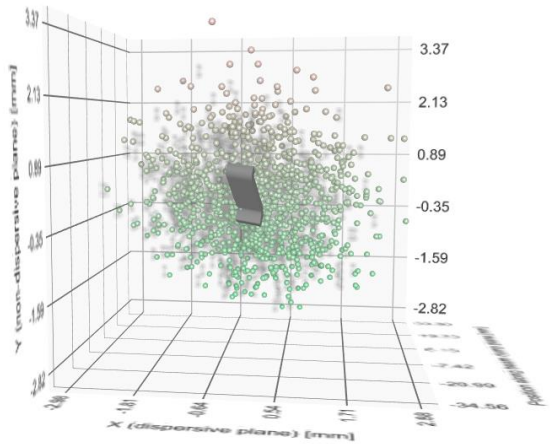


Adding the high poly model in the High Definition Meshes section overlays the mesh on top of the low poly file first imported in the project. Baking will transfer information from a high poly mesh to a texture file to preserve quality details, but not vertices, to the model.



SolidWorks in ARIS Beam Dump Plot





Initial before rotation and scaling