



Lithophane Tutorial and Calibration Toolkit



quattro

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Summary

How to turn any image into a lithophane that is calibrated to your filament. All with Open source tools.



0.39 hrs



5 pcs



0.10 mm



0.40 mm



PLA



2 g



Prusa MINI /
MINI+

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Tags: [lithophane](#) [pendant](#) [glowinthedark](#) [tutorial](#)
[calibrationtool](#)

Imagine walking into a UV lit location wearing a picture of **Darth Vader** or **Spock** around your neck! It will immediately light up and will show everyone that the **Force** in fact is with you or you find something **fascinating** while raising an eyebrow.

I have included these two designs in the examples. For this isn't just a model of two pendants. This is a **tutorial** and a **toolkit** to make your own with any suitable picture. The fun doesn't stop there, ever heard of a

lithophane and wished there was one of your favorite picture? Loved one, pet, car or maybe a landscape? Perfect gift for Christmas btw.

Look no further!

Know your Filament

First of all you should know what your filament is capable of. For this purpose I have made some filament testers. There are 2 variants:

True lithophane

This one features a wide frame to allow for a better judgement against a bright light.

White on black image

This has a base of black filament to act as a proper background.

Testing

Just print a fitting tester with the filament(s) you are going to use and find out what it is capable of.

The tester has numbers on it, those are the layers of filament printed of top of each other. For obvious reasons 100% infill is required.

As long as a difference between the segments is visible this layer height can be used.

So, if you can see a difference between 7 and 8 but 8, 9 and 10 all look the same, this means: You can use up to 8 layers. Using 9 layers or more will not further increase the dynamic range of the resulting image.

I have included a tester for lithophane (with frame) and for pictures. Also, there is one extended tester for lithophanes with 20 segments. They are designed for 0.15mm layer height.

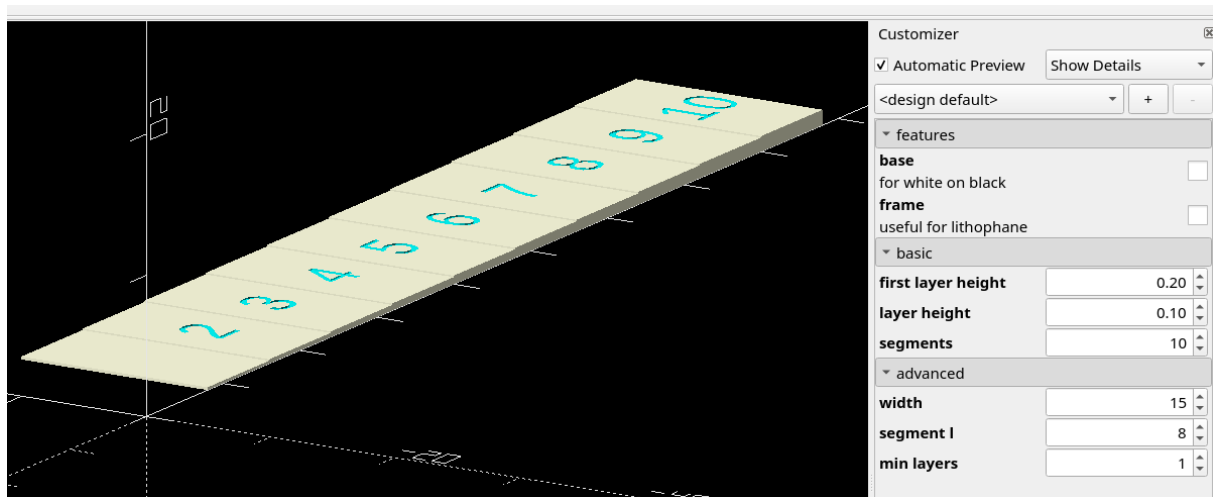
Additionally there are versions for 0.10mm layer height.

As this is open source, you can create your own tester with the `Filament_Tester.scad` file in OpenSCAD.

Configuring your filament test part (Optional)

If you have used OpenSCAD before, please skip the next two paragraphs!

OpenSCAD is like a programming language for CAD. Designs are done by writing text. No worries, you don't have to write a single line of code. I did that for you! What you are going to use is the customizer seen on the right on the screenshot below. Go ahead and open the Filament_Tester.scad file in OpenSCAD. The customizer on the right presents you with some options that influence the design. It will update automatically. Try it out! You can always go back to the defaults.



Once you are satisfied, click the render-button, marked in yellow in the screenshot below and once it is done, click the Export-STL button, marked in pink.



That's it! You have successfully used OpenSCAD!

Description of the fields:

base: Print a background for white on black prints

frame: print a wide frame around the tester to better see the test fields

first layer height and **layer height:** According to your printer's capabilities. lower layer height result in more available shades.

segments: Number of segments to print. Usually 10 is good. Dedicated lithophane filaments and low layer heights may be capable to pull off 20 shades.

Prepare the Image

So you have your filament all dialed in? Let's get the actual image ready.

This step is the same regardless if you want to make a true lithophane or a 3d-printed opaque image.

Convert to Grayscale

Most pictures come in pretty colors these days but we will not use those. You can just click on “convert to grayscale” on any image manipulation software but there are better ways.

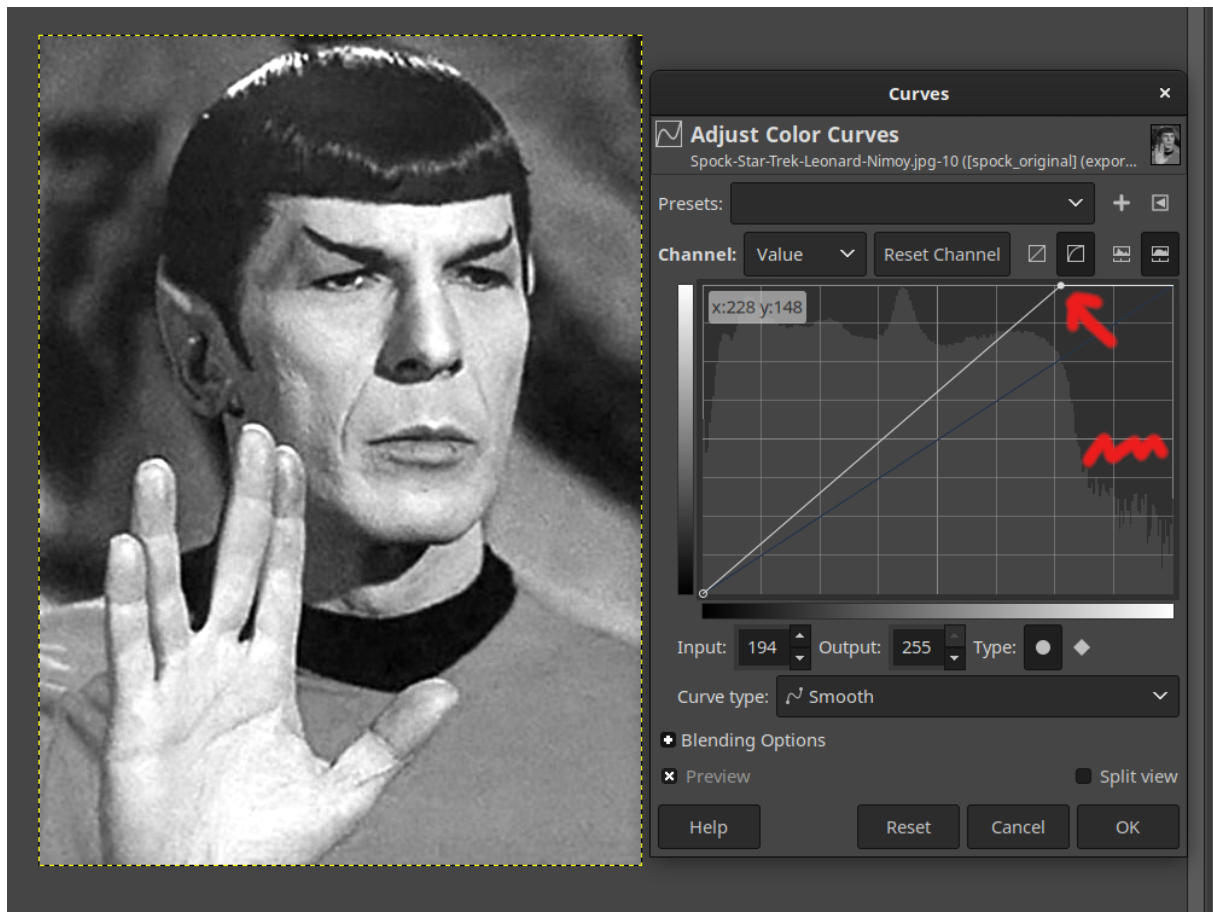
Color images consists (in general) of 3 colors: red, green and blue. Using only one of these may actually result in a way better grayscale image than using all of them combined. For faces, the green channel usually looks nice.

In GIMP, this can be done by selecting “Colors → Components → Extract Component” which brings us this screen:



Next we are going to max out the dynamic range. This is important because we have only a very limited dynamic range in a lithophane and dynamic range wasted in the source picture will result in a dull result.

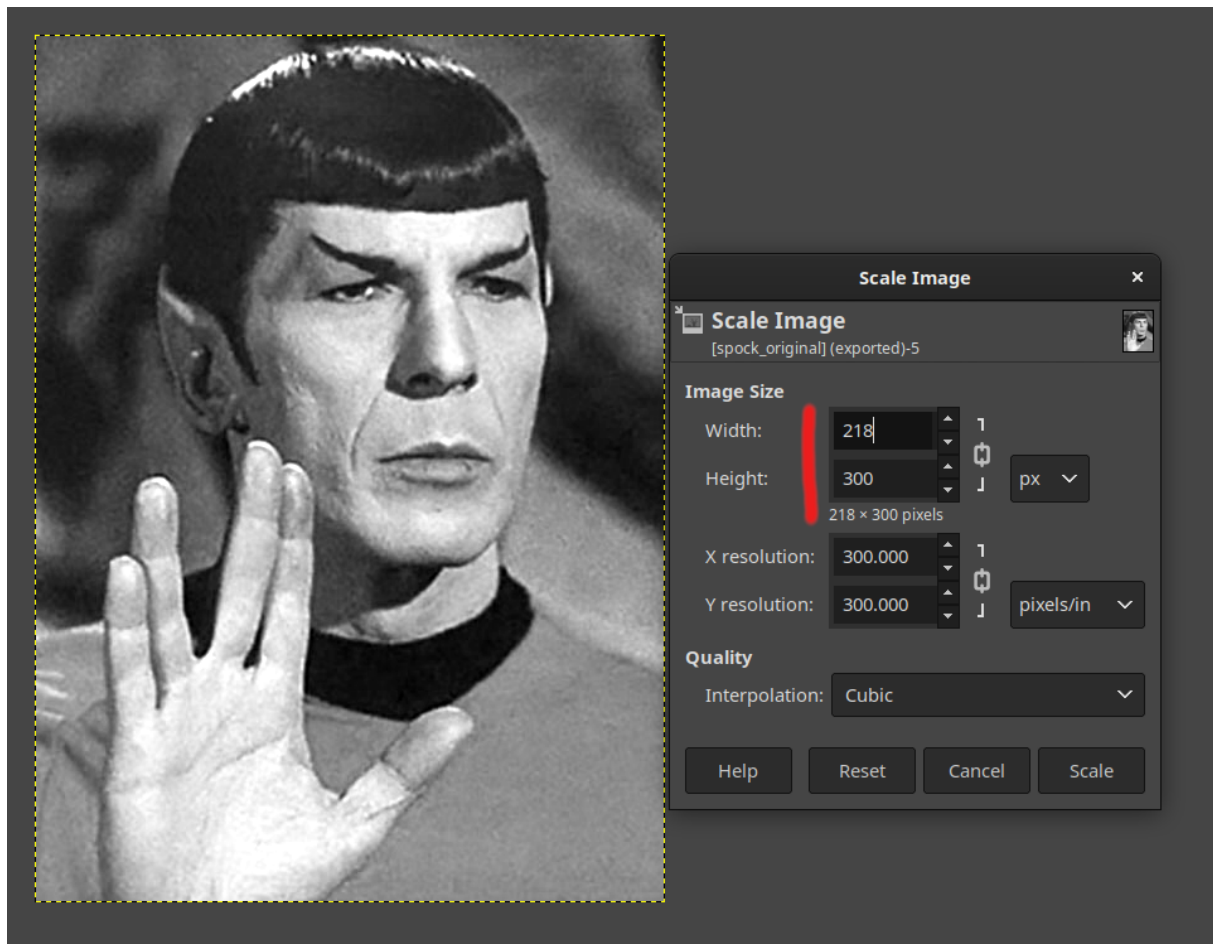
Again, go into “Colors” then “Curves...”.



Compress all those bright but not really full white low spikes (marked) in the histogram into a full white by dragging the white point to the left. You also may want to pull the middle ranges up a little bit to get a nice dynamic picture that looks slightly overexposed.

Finally we (in most cases) need to scale the image down so OpenSCAD will not eat all your Random Access Memory. With 16 GiB of RAM, a maximum of 300x300 Pixel should be observed.

In GIMP, this is in "Image → Scale Image..."

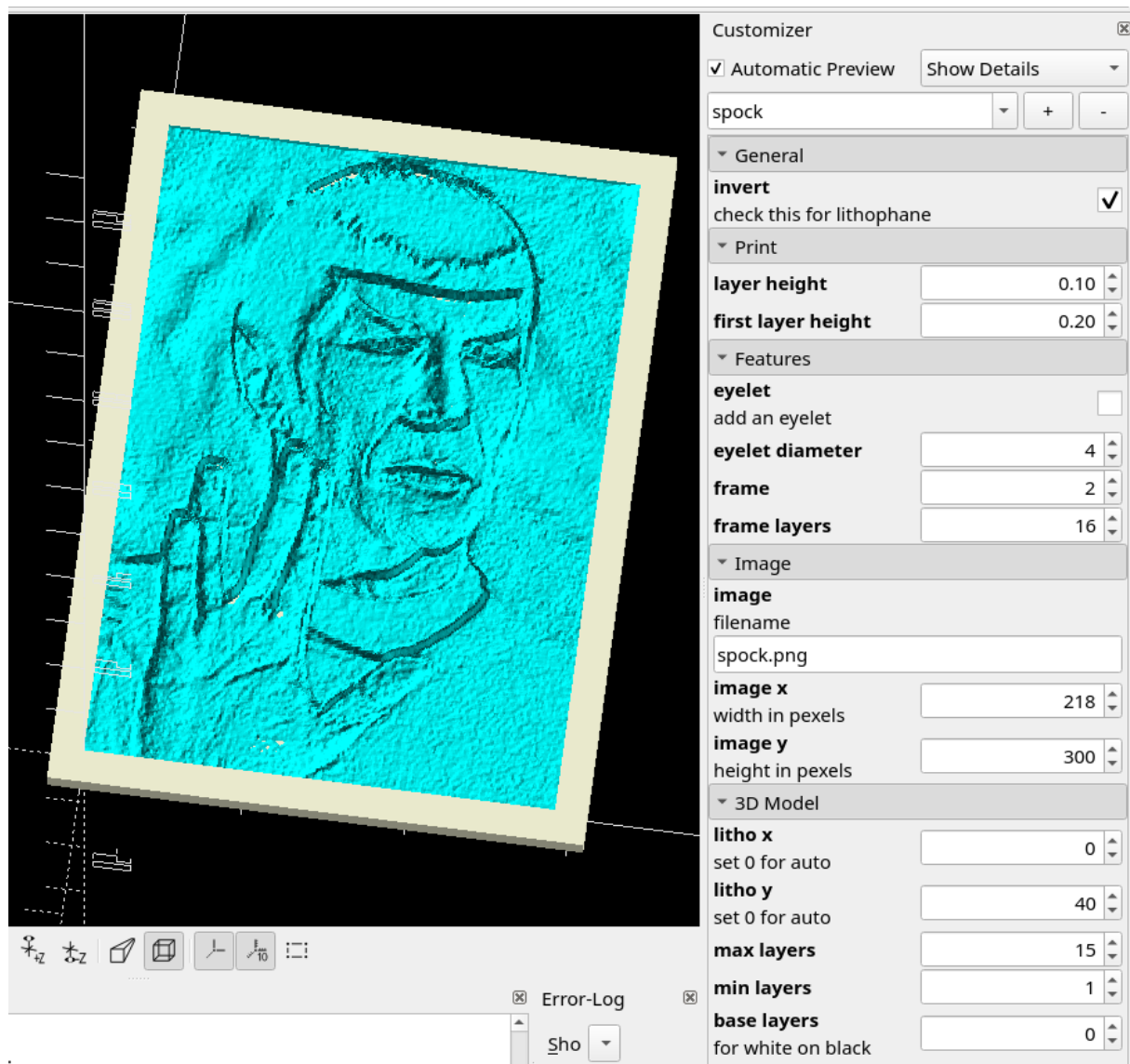


Export the resulting image and move to the next chapter.

Generating the STL File in OpenSCAD

We are now converting a 2D image to generate a 3D model.

OpenSCAD can do this but it requires some work. Luckily I came up with a tool to make it really easy. Here is a screenshot of the Customizer. I'll explain what it does down below.



General

For a true lithophane, check the **invert** checkbox. It ensures that the resulting 3D model is a negative of the image so dark areas are thick and light areas are thin.

Print

The tool needs to know what the layer height is going to be to tailor the model to your printer's capabilities.

The **first layer height** in Prusa Slicer is always 0.2mm (MINI, 0.4mm nozzle) so it can be set independently from the **layer height** of the other layers.

Features

Small white on black style prints can be used as a keychain or pendant and for this purpose I included an optional **eyelet** on top of the model. Just enable it by checking the box and adjust the **diameter** to your needs.

Sometimes it is nice to have a **frame** around the image to give it a contour. The **frame** parameter determines the width of the frame in millimeters. The **frame layers** parameter determines the height.

Image

Type in the **filename** (sorry, there is no fancy file chooser in OpenSCAD) and set the **dimensions** of the image in pixels. Unfortunately there is no way to get this automatically.

3D Model

Set the size of your lithophane with **litho x** and **y**.

The **min** and **max layers** are determined by your calibration print. And the **base layers** are the background if you do a white on black print.

Click on render, then export the STL file and you are done with this step.

Slicing

Slicing is pretty much straight forward for a lithophane, for white on black pictures, insert a color change right above the base plate/background.

Please select **100% infill** to ensure the material thickness is as expected and thick parts are not hollow as this would change the appearance.

Be sure to select the same **layer height** you chose while generating the STL files. This ensures that everything lines up nicely.

Printing

Printing is also easy. However, there are some things to consider.

First layer calibration: If you make a lithophane and use 1 as the minimum layer height, you may want to ensure your first layer is completely opaque and does not show any holes. Perhaps lower it by 0.05mm from the optimum to ensure a good quality. On the left there is a sheet of one layer from my Prusa MINI+. Some gaps in the corners are ok.

A word about **glow in the dark** filaments: The stuff that makes them glow is called strontium aluminate. It is a very hard material and it will grind down your shiny brass nozzle in no time, so be sure to use a **hardened steel nozzle** for that!



Filaments

Glow in the dark for white on black: **Overture Glow in Dark (green)** (one of the brightest out there) I also tested **colorFabb SPECIAL GLOWFILL** which is slightly brighter but it maxes out at 5-6 layers and doesn't add any dynamic beyond that.

Background for white on black: Any **black filament** will do.

Lithophane: **Azurefilm PLA Glow filament Litho White** (the one I have is missing the "Glow" in the product name but the part number FP171-9012 is the same)

Note: some links in this text are "affiliate links", that means, if you follow them and then purchase something, I may get a few coins from that. That does not affect your purchase in any way.

Model files



Glow in the Dark Pendant Examples

4 files



litho_vader_pendant.3mf



litho_spock_pendant.3mf



litho_vader_pendant.stl



litho_spock_pendant.stl



Lithophane Examples

6 files



litho_spock.3mf



litho_vader.3mf



litho_face.3mf



litho_spock.stl



litho_vader.stl



litho_face.stl



Filament Testers 0.15mm Layers

3 files



filament_tester.stl



filament_tester_litho.stl



filament_tester_litho_20.stl



Filament Testers 0.10mm Layers

2 files



filament_tester_litho_20_010.stl



filament_tester_20_010.stl

Print files



Glow in the dark Pendants

2 files



litho_vader_pendant_04n_01mm_pla_miniis_23m.bgcode

PLA 0.40 mm 0.10 mm 0.39 hrs 2 g Prusa MINI / MINI+



litho_spock_pendant_04n_01mm_pla_miniis_21m.bgcode

PLA 0.40 mm 0.10 mm 0.35 hrs 3 g Prusa MINI / MINI+



Lithophane Examples

3 files



litho_vader_04n_01mm_pla_miniis_26m.bgcode

PLA 0.40 mm 0.10 mm 0.43 hrs 2 g Prusa MINI / MINI+



litho_spock_04n_01mm_pla_miniis_21m.bgcode

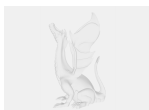
PLA 0.40 mm 0.10 mm 0.34 hrs 2 g Prusa MINI / MINI+



litho_face_04n_01mm_pla_miniis_21m.bgcode

PLA 0.40 mm 0.10 mm 0.34 hrs 2 g Prusa MINI / MINI+

Other files



litho_tutorial_openscad_files.zip

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