PixInsight – Steps to get your Galaxy

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These are only tipps to work with some features of PixInsight to development your galaxy image. Each image is unique and need it's own processing.
You should know the principle handling of PixInsight to understand following guide.

This document works with following facts:

- PixInsight 1.7
- b/w camera and images in L, R, G and B

You find the described XPSM files on following web-link:
http://www.astrophoto.at/PixInsight

Quick Guide:

1) Master-Bias / Master Dark
2) Calibrate Flats
3) Master-Flat
4) Calibrate images
5) Remove remained hot- and darkpixel
6) Register images
7) Integrate images
8) Remove remained disturbances
9) Generate RGB
10) Calibrate RGB channels

11) Crop RGB and L images

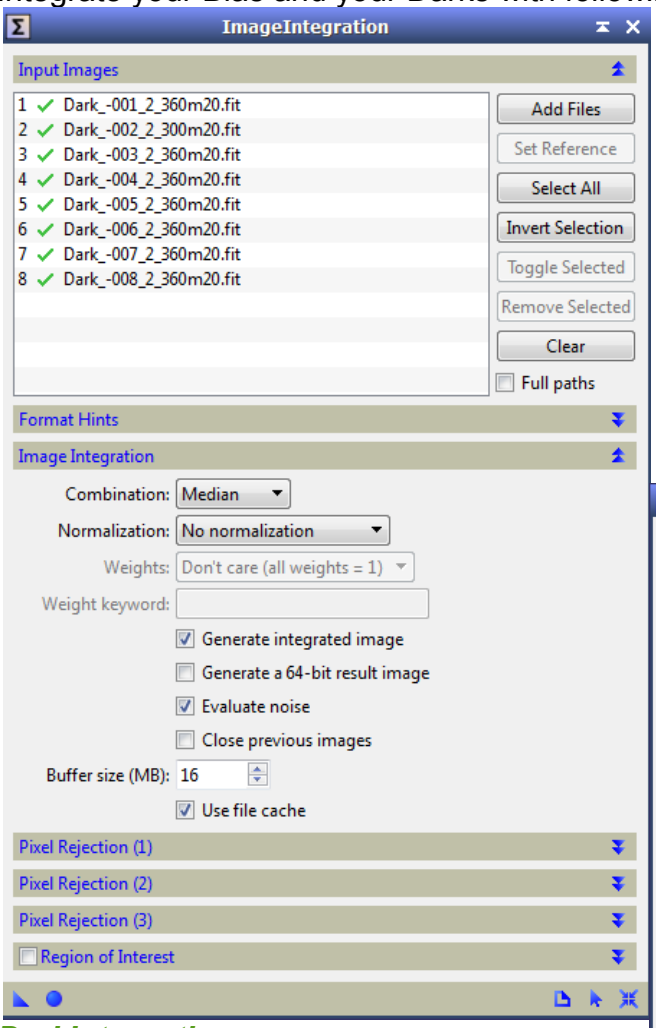
12) Remove gradient
13) Scale the brightness of RGB
14) Make stars of RGB smaller to avoid color halos
15) Increase color saturation
16) Reduce noise of RGB

17) Scale the brightness of L
18) Darken the center of galaxy
19) Make stars smaller
20) Enhance Dark structures
21) Sharpen of L
22) Remove hot- and darkpixel which are generated by previous processing

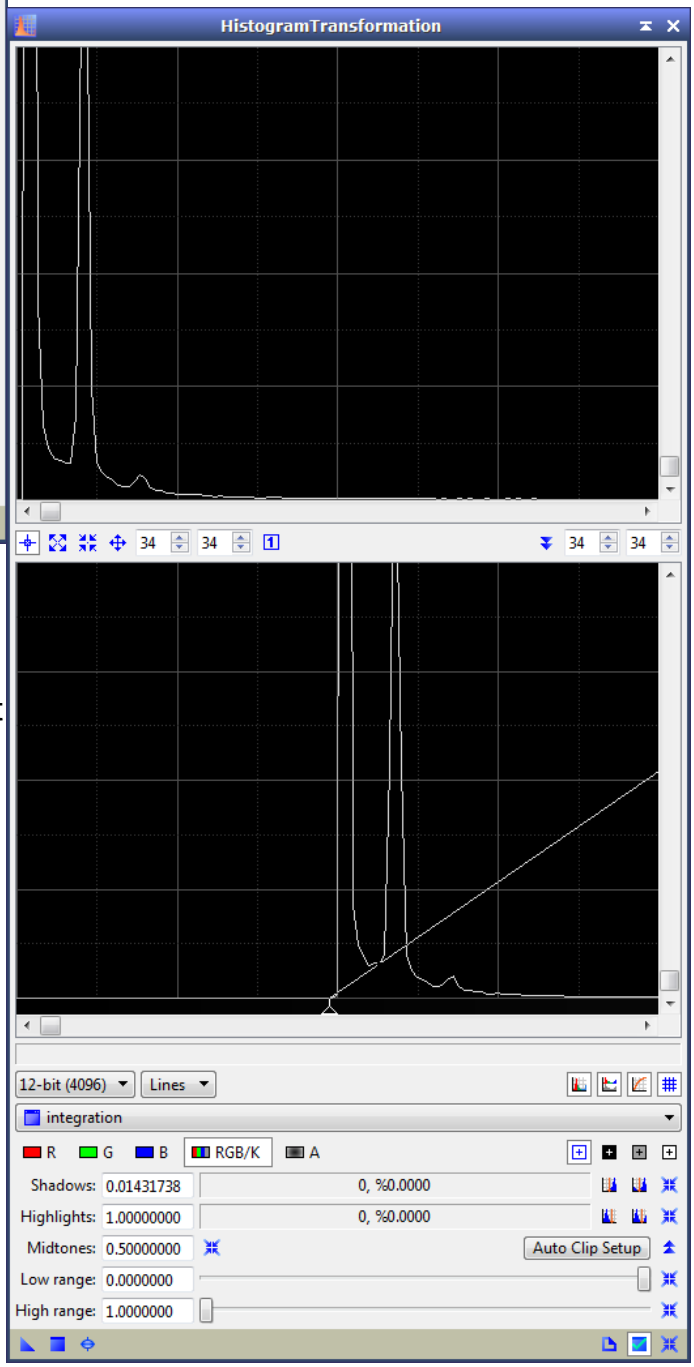
23) Generate LRGB
24) Remove unwished color tint
25) Increase color saturation
26) Final curves transformation for wished brightness

1) Master-Bias / Master Dark

Integrate your Bias and your Darks with following parameters:

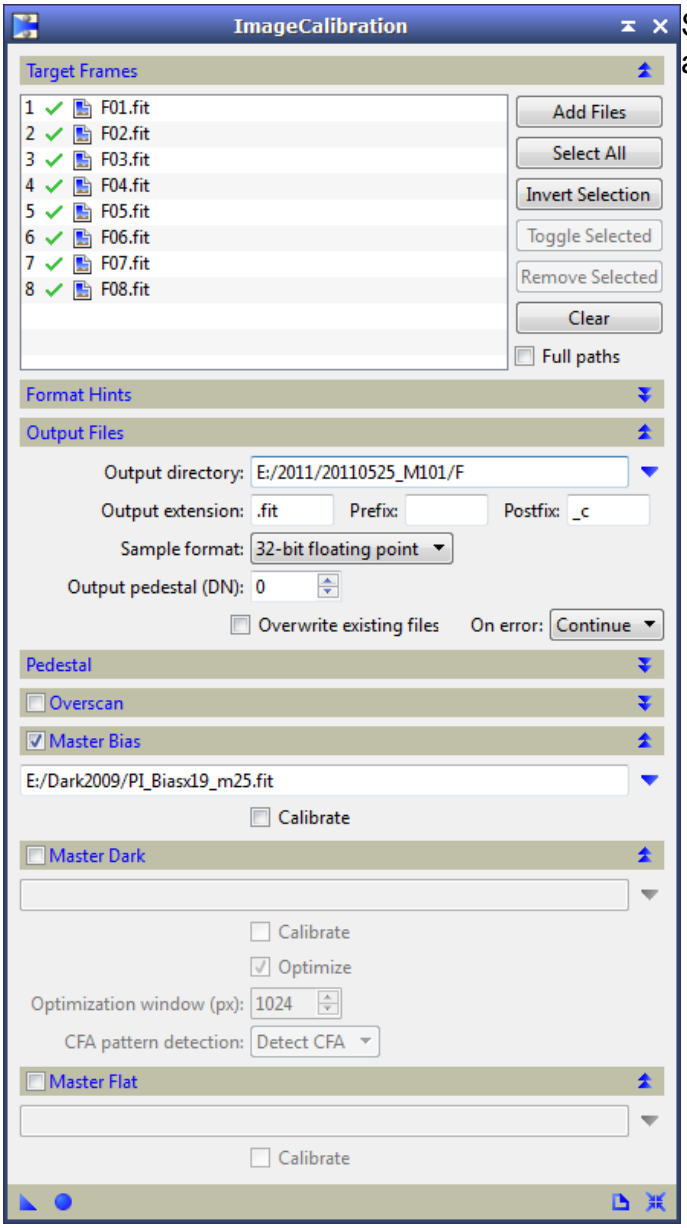


DarkIntegration.xpsm



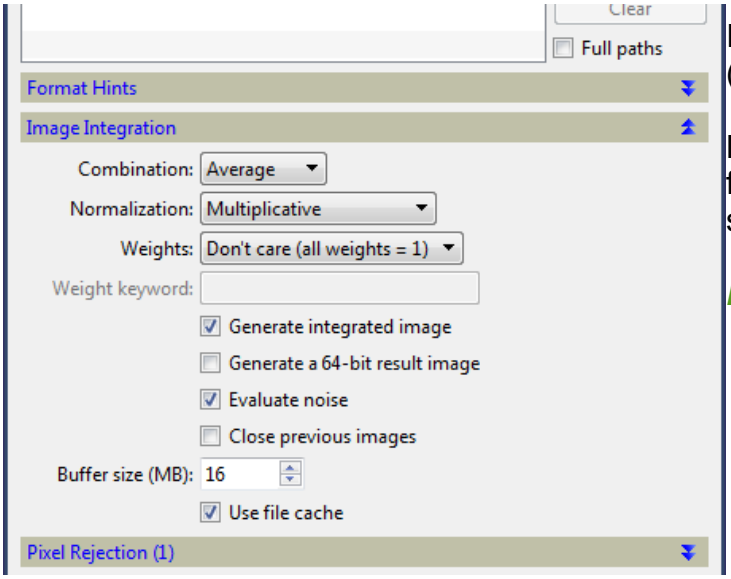
Control your Dark and Bias integration image. Is the left shoulder not on the left side, your image fetch program has added an offset. Cut the offset! In other case the image calibration fails.

2) Calibrate Flats



Substruct the Bias from Flatfield. If you also have a Flat-Dark, substract it too.

3) Master-Flat

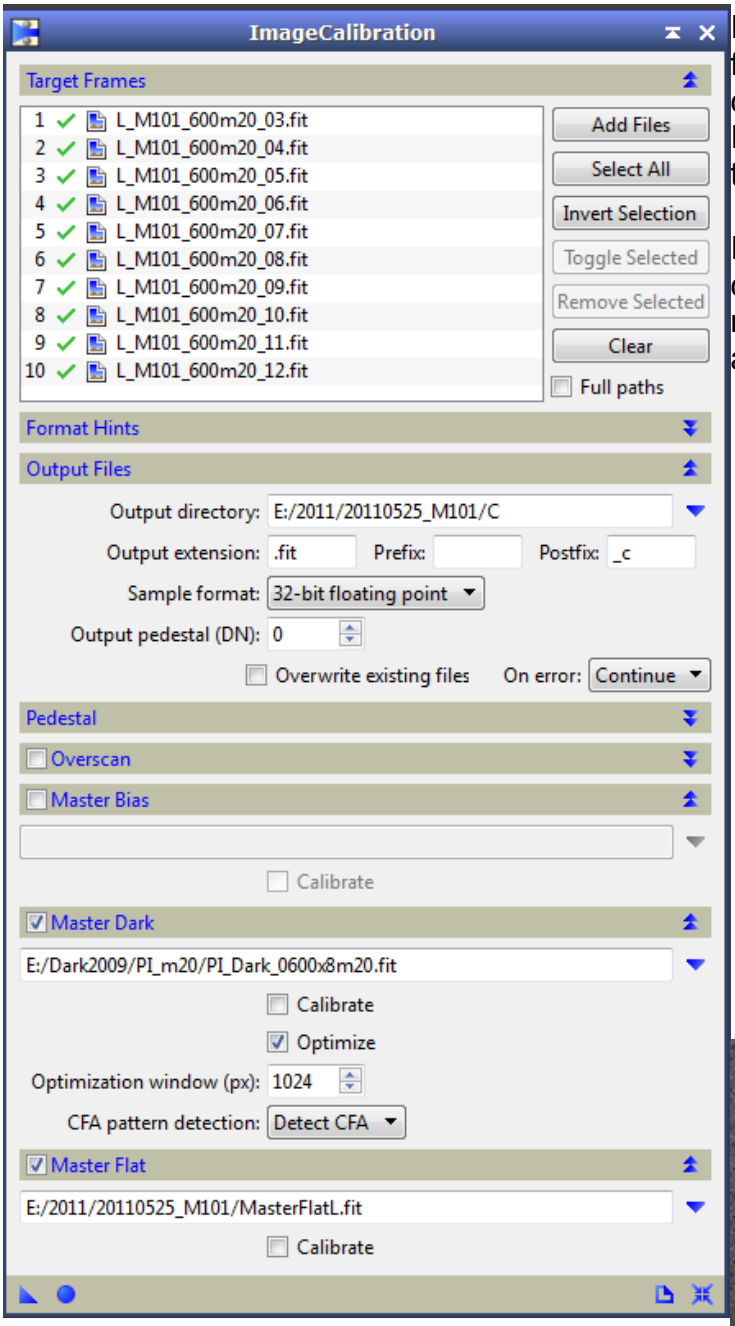


ImageIntegration with this parameters. (no pixel rejection)

Normally you take for each channel flatfields (L, R, G, B). Integrate it seperately.

FlatIntegration.xpsm

4) Calibrate images



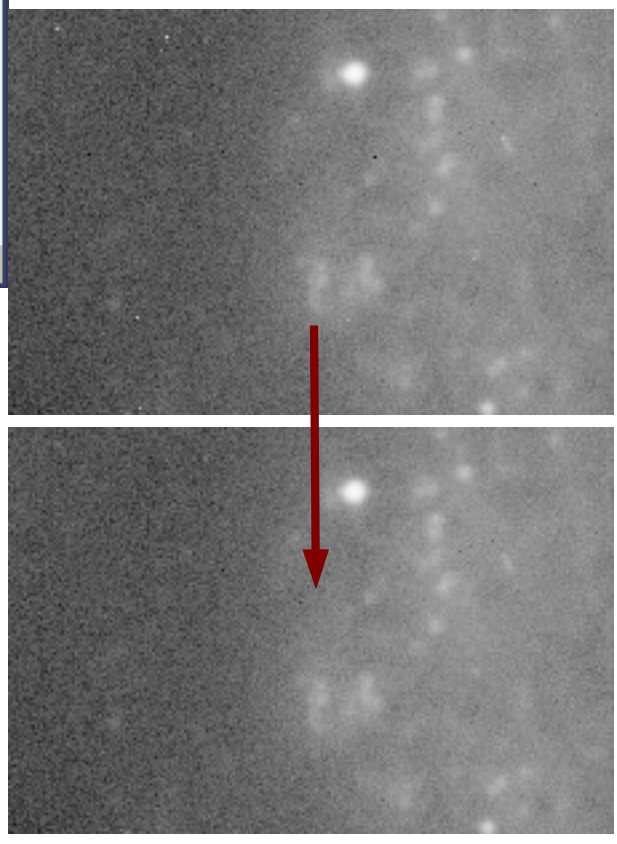
If you don't have substract the Bias from your Master-Dark, you must not check the "Master Bias" checkbox!!! In other case PI substract the Bias twice.

Integrate L, R, G and B seperately and change the Master-Flat filename to the right. Also change the Dark if you have another temperature or binning.

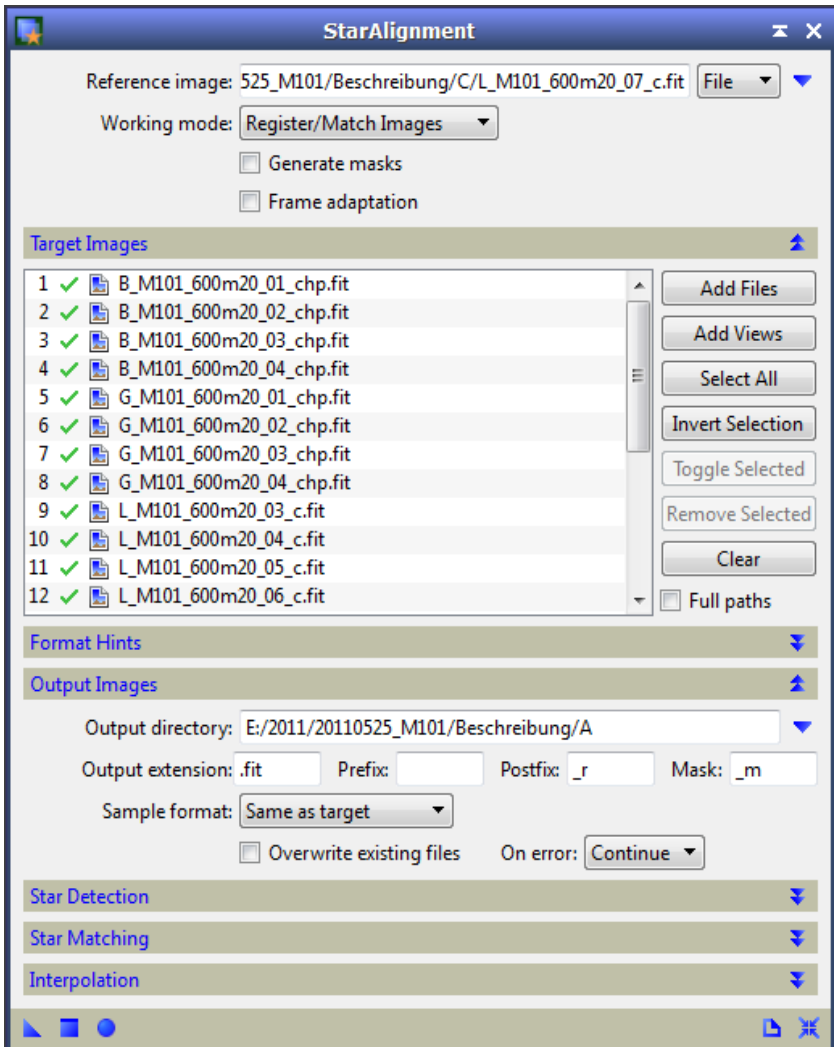
5) Remove remained hot- and darkpixel

Sometimes ther are hot- and darkpixel after calibration. Use following PixelMath function to remove it. You can also edit it to change the threshold.
Use RemoveHotPixel.xpsm at first, in other case sometimes you get a halo around the hotpixels.

RemoveHotPixel.xpsm
RemoveDarkPixel.xpsm



6) Register images

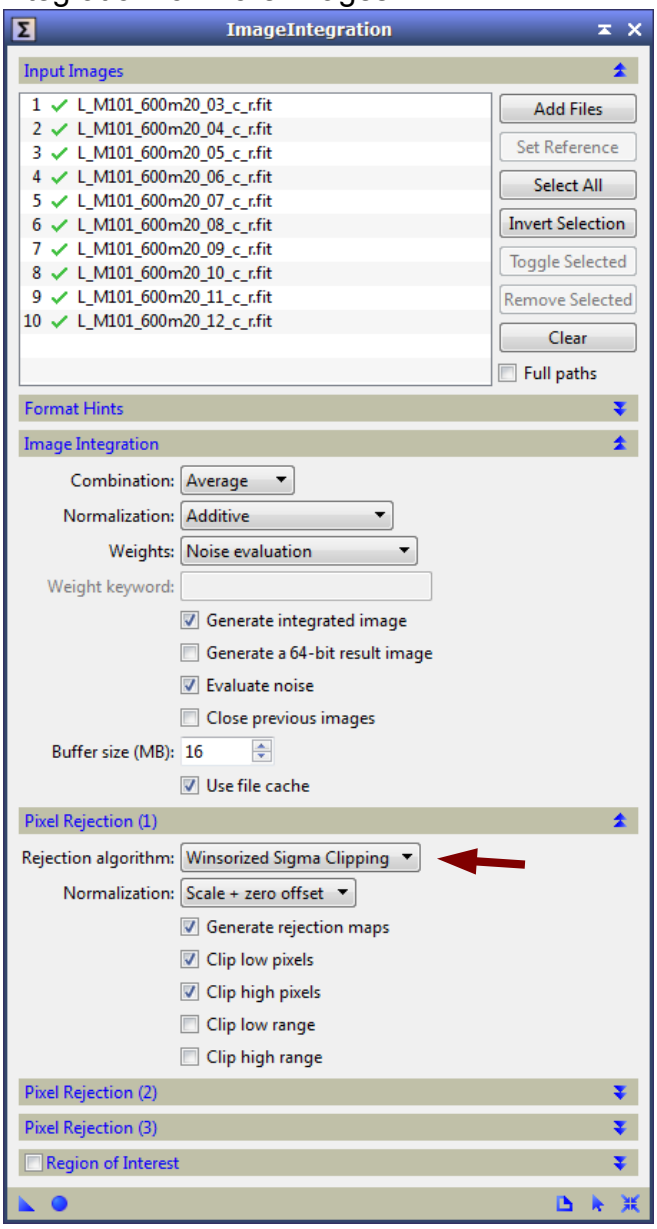


Select one of the L images as reference and put all R, G, B and L images in the "Target Images" field. Select your output directory and press the round button on the bottom.

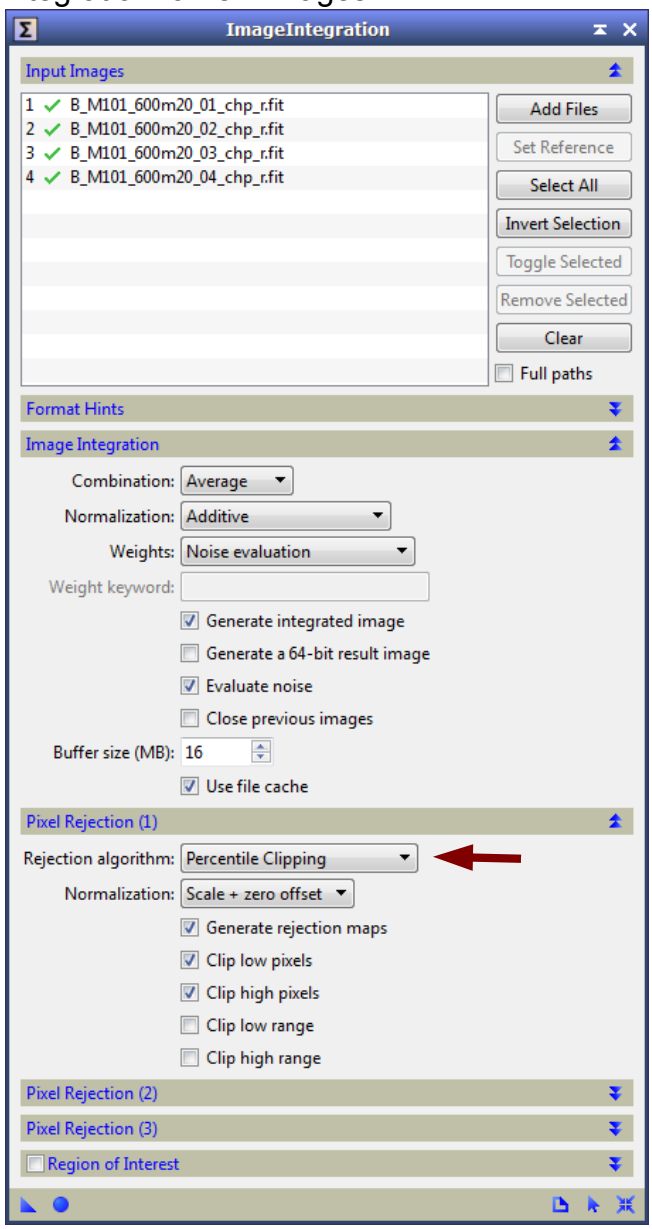
7) Integrate images

In this example, I took 10 images for L and 4 images for each color channel.

Integration for more images

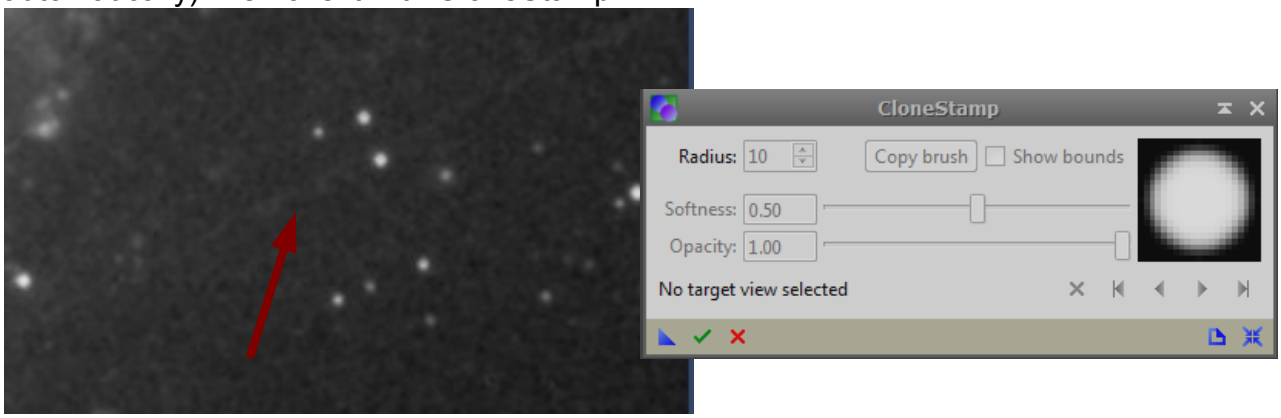


Integration for few images

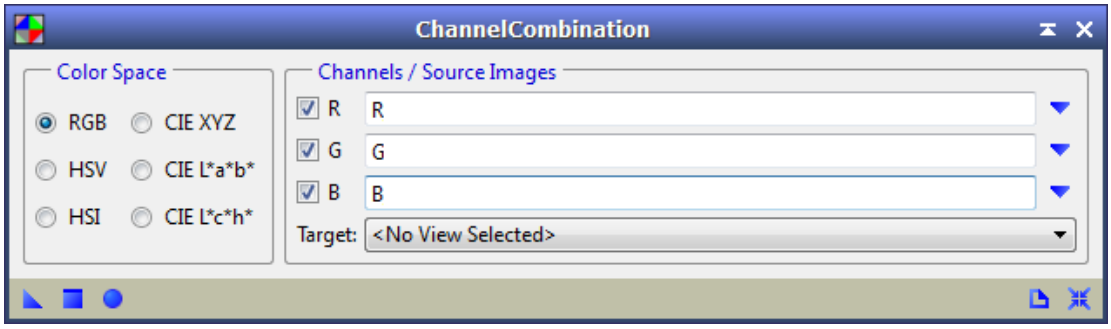


8) Remove remained disturbances

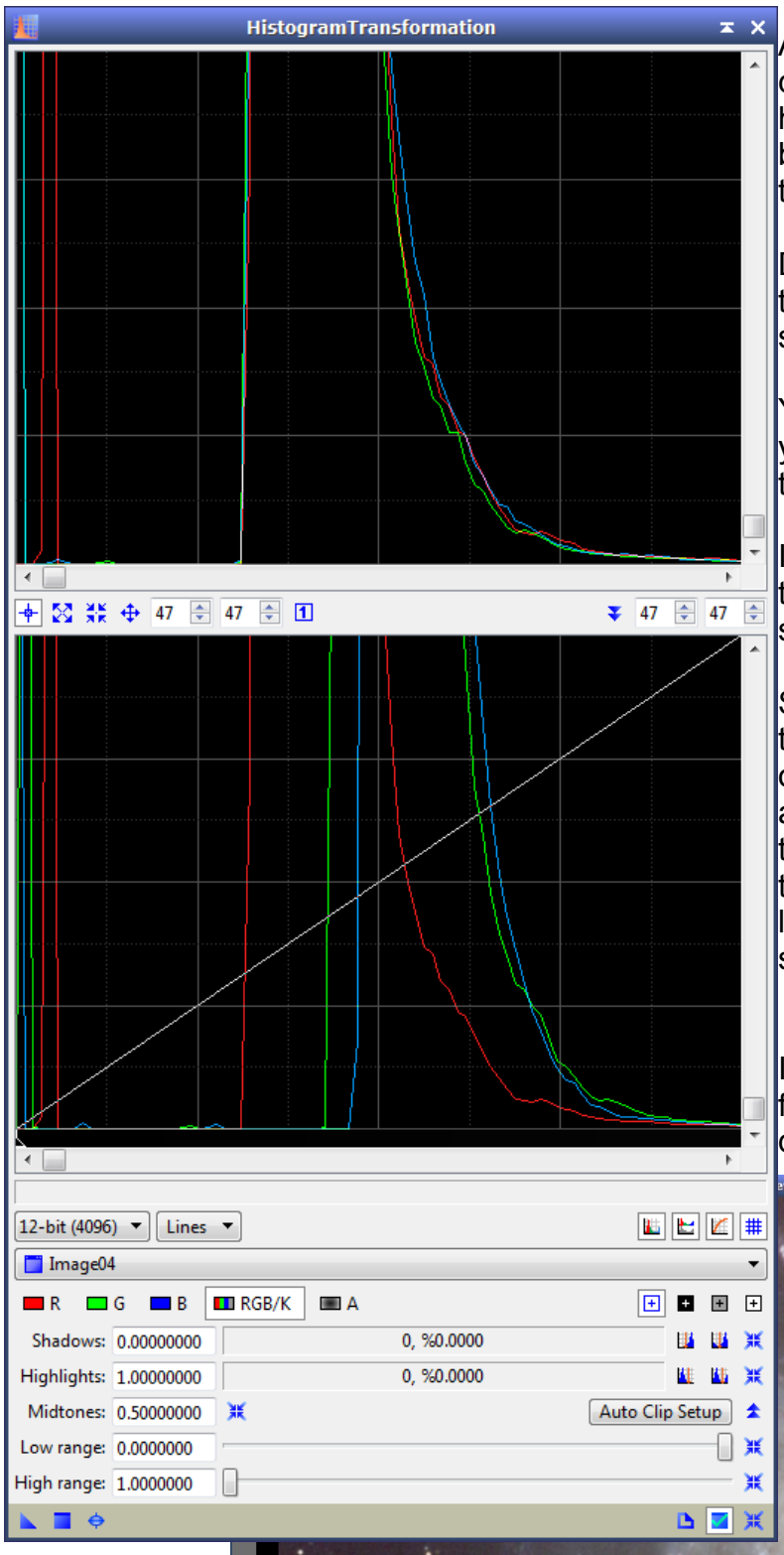
In this case, the red channel has a remained satellite track (to few images to remove it automatically). Remove it with CloneStamp.



9) Generate RGB



10) Calibrate RGB channels



Align the left shoulder of the RGB channels. In the example case I have to strech the blue channel, because the blue filter is darker than the others.

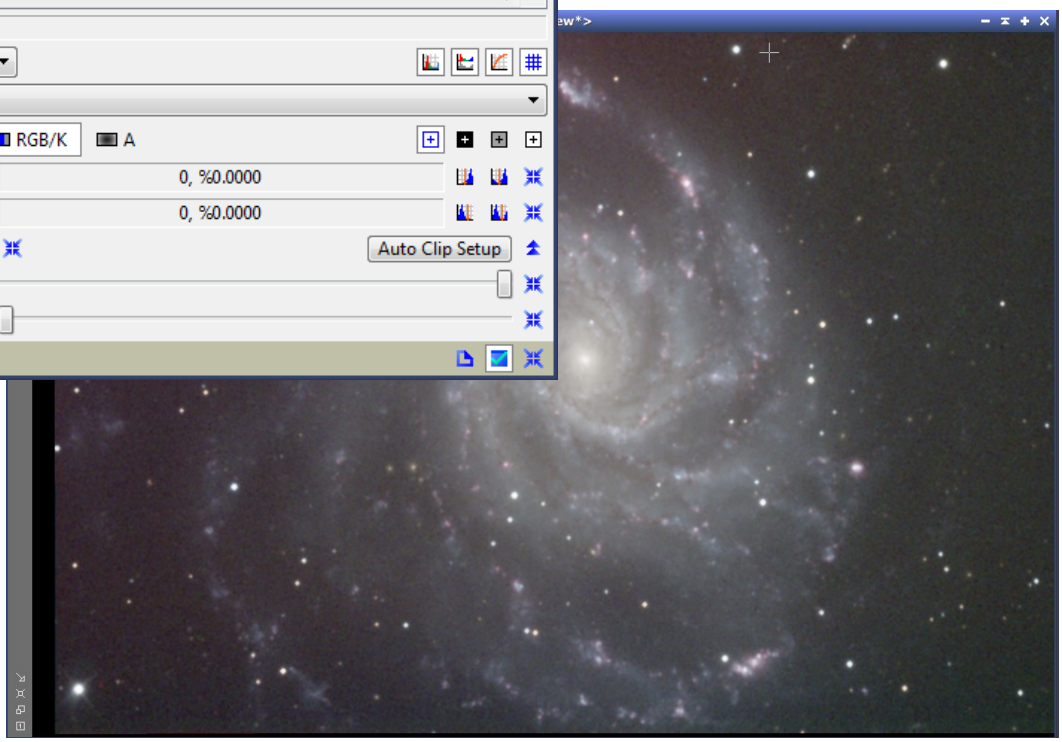
Don't forget to select the  to see the histogram of the selected image.

You can zoom in of the histogram if you are over it with the mouse and turn the mouse wheel.

In this case, select green and shift the left arrow to right until the left shoulder is aligned with red.

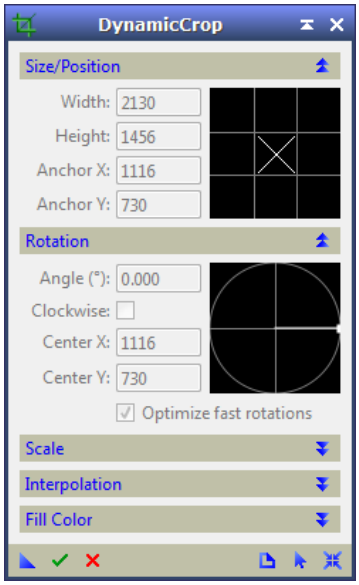
Select the blue channel. Zoom out the source histogram (the lower one) and shift the midtone (middle arrow) to the left until the width of the blue channel is the same as the others. Zoom in and shift the left arrow until the blue left shoulder is aligned with the other.

I know, there are also automatic functions in PixInsight, but I like to do this process manually.

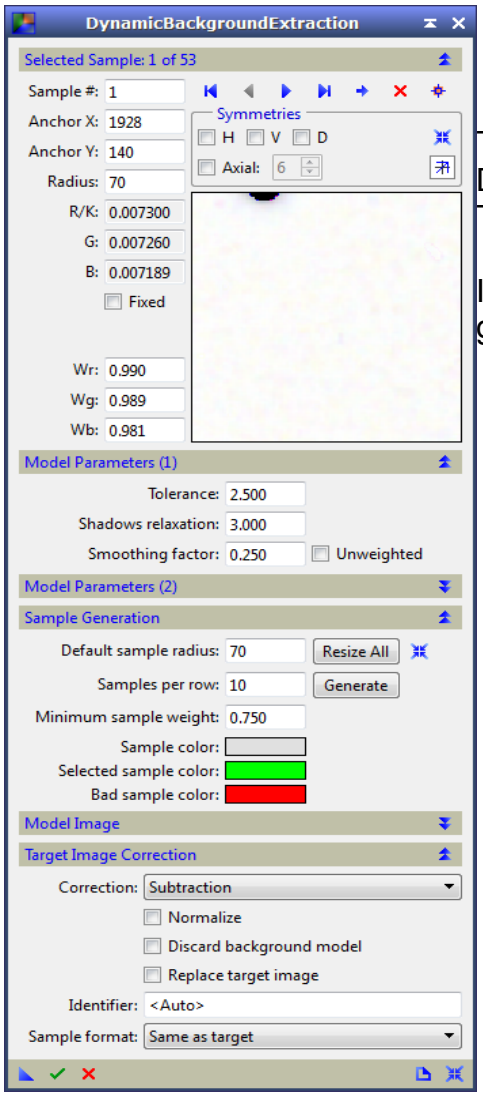


11) Crop RGB and L images

Check RGB and L for the common area and draw the crop rectangle. Save the DynamicCrop process (pull the triangle to the working place) for using the same process for RGB and L.

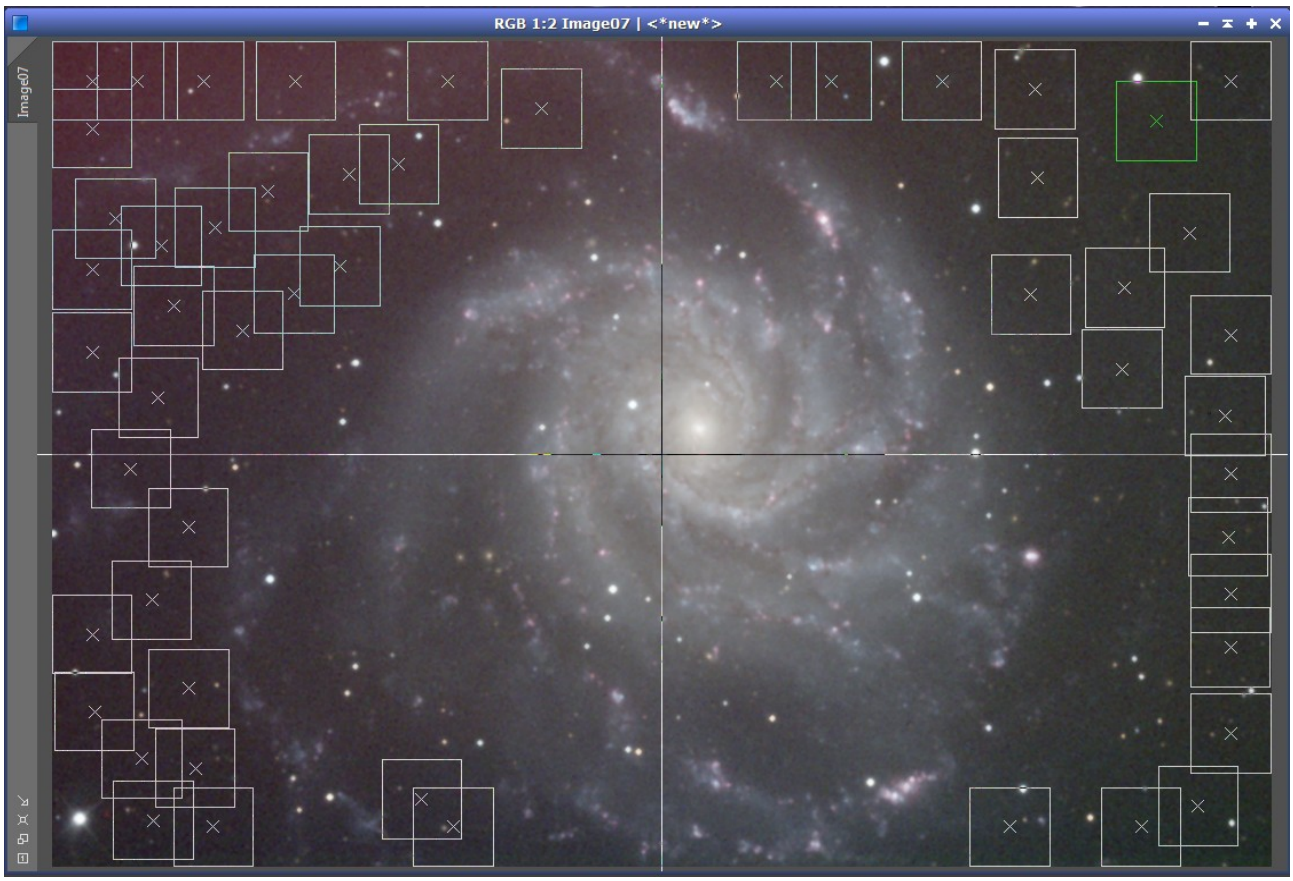


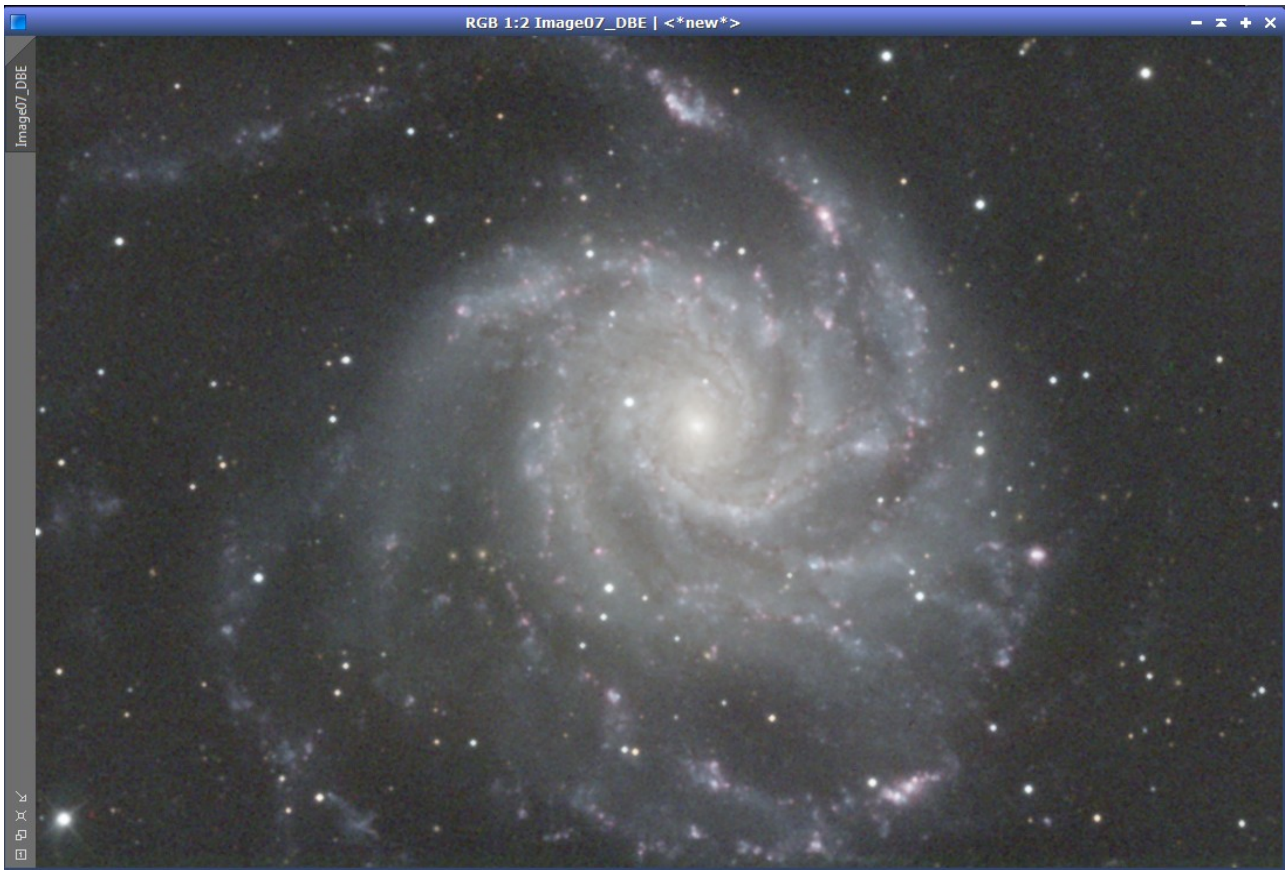
12) Remove gradient



Tolerance: 2,5
Default sample radius: 70
Target Image Correction: Substruction

If you take big boxes and overlap it, mostly you get a good result.

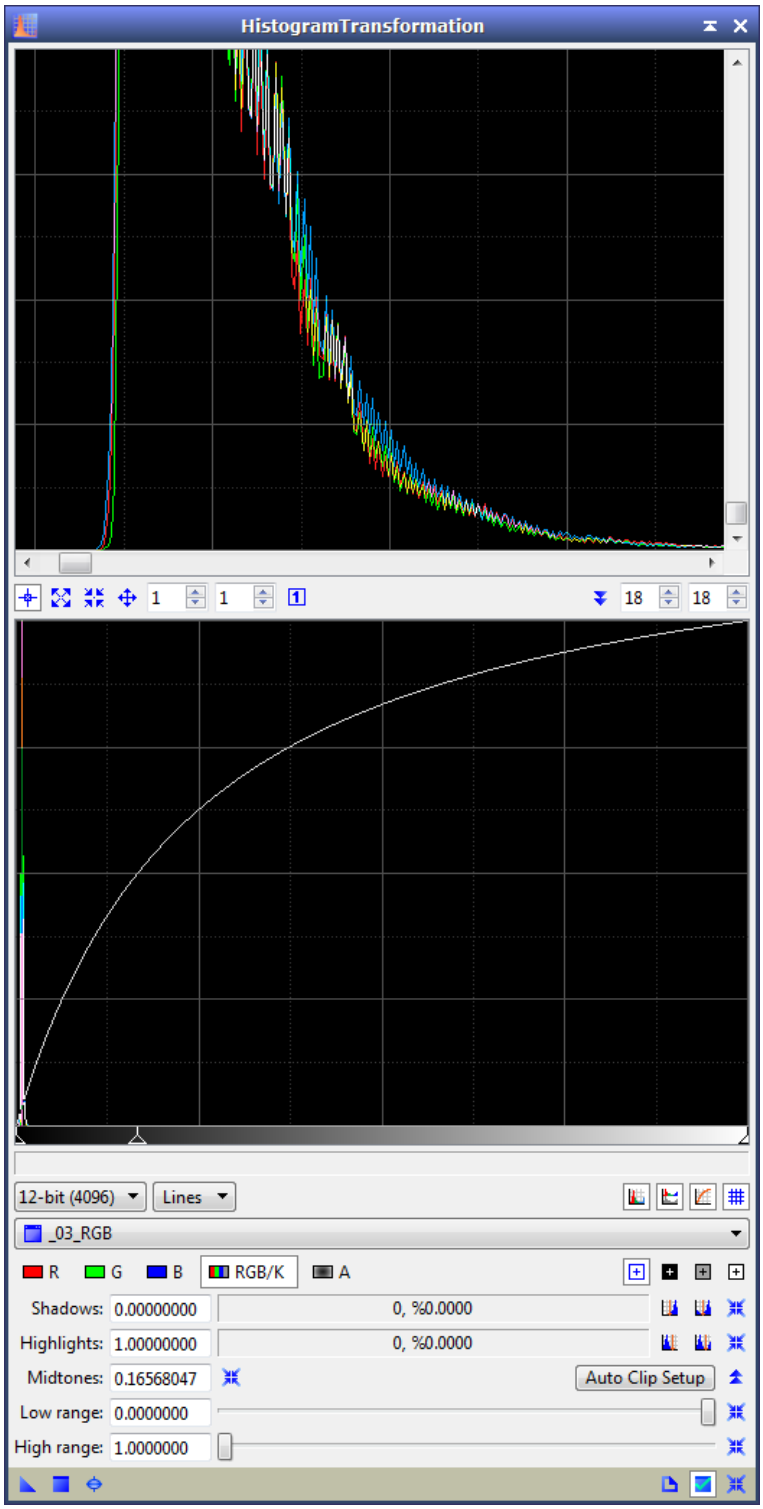

RGB 1:2 Image07 | <*new*>
Image07


RGB 1:2 Image07_DBE | <*new*>
Image07_DBE

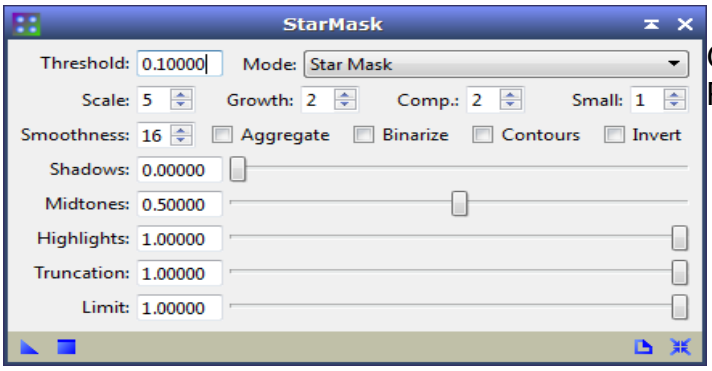
13) Scale the brightness of RGB

Increase the brigthness of the RGB image step by step. At first reset the "ScreenTransferFunction" to see the real brightness of image. Then repeat following process until the center of the galaxy have a black-value of app. 0.7 to 0.8.

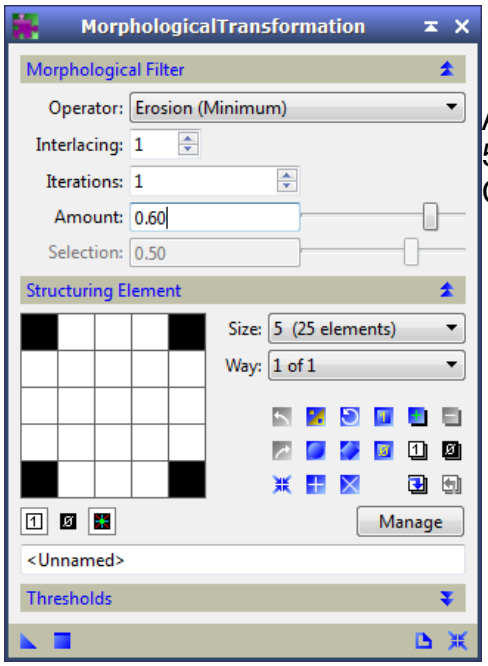
- make a clone of the image
- invert clone
- take the clone as mask for the image
- shift the midtone arrow of histogramm (RGB/K selected) a bit to the left
- execute the histogram change
- close the clone image (mask of image is automatically removed)



14) Make stars of RGB smaller to avoid color halos

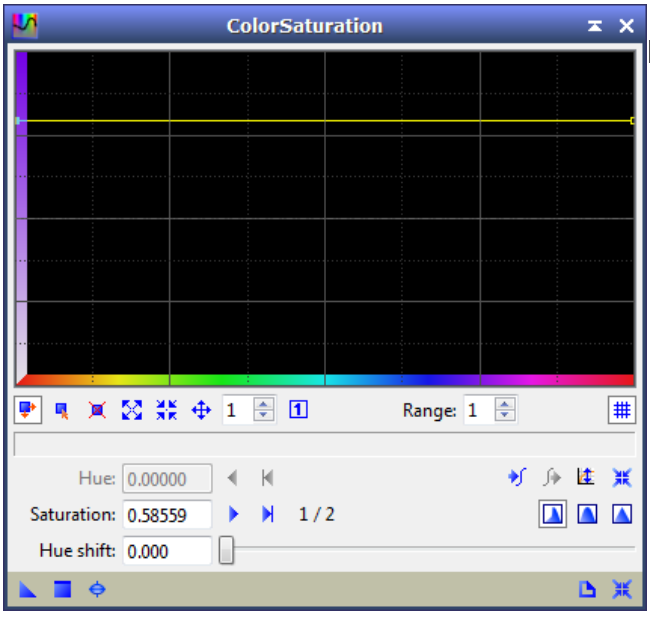


Generate star mask with default values.
Put the star mask to the image.



Amount:0.6
5 elements
Circular structure

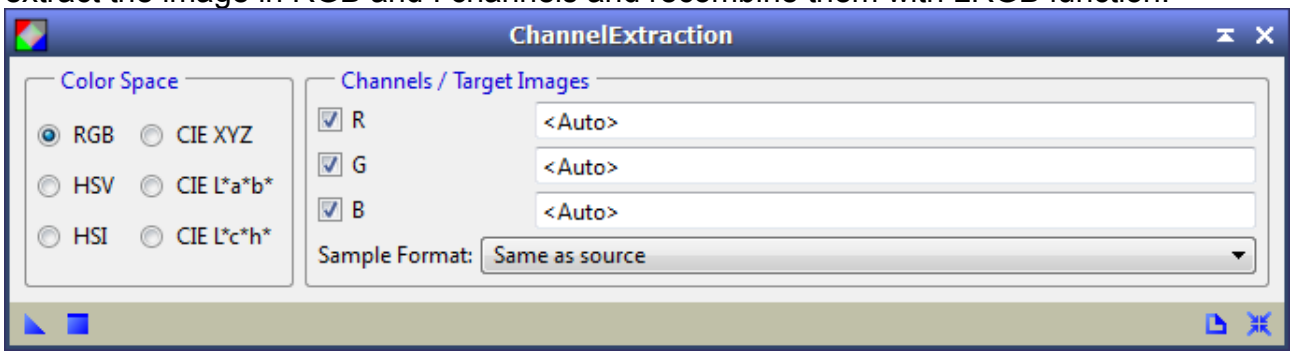
15) Increase color saturation

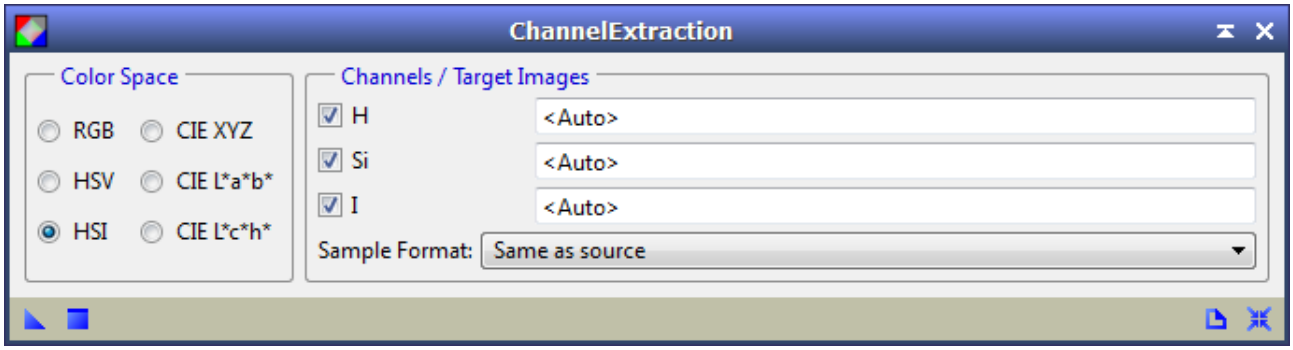


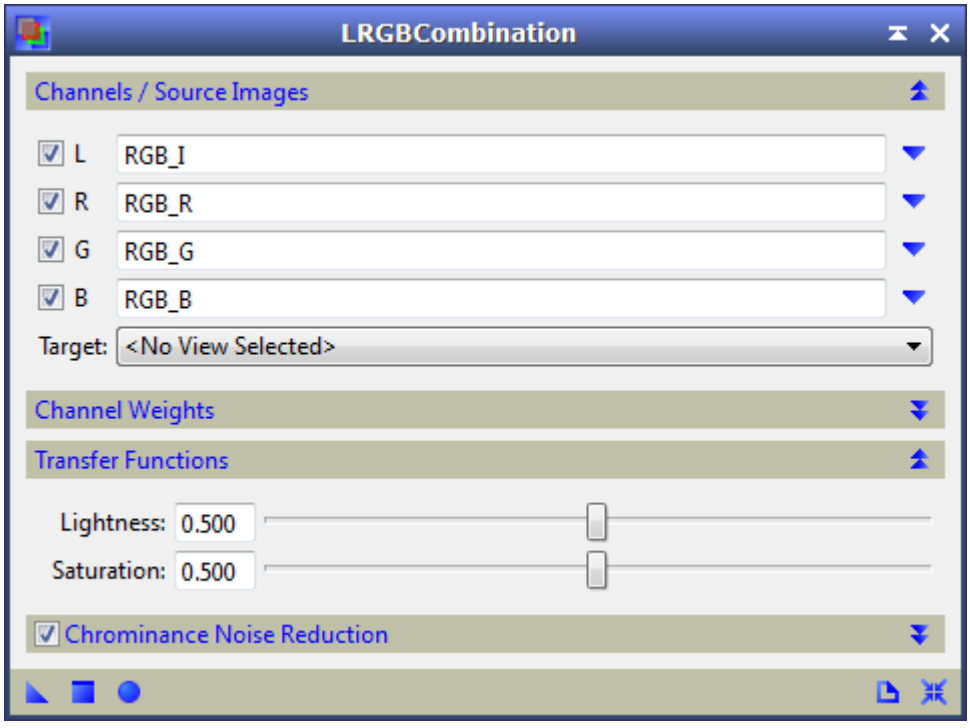
If the color saturation is very flat, increase it.

16) Reduce noise of RGB

If there is a noise in the background of the RGB, you can remove it or decrease it, if you extract the image in RGB and I channels and recombine them with LRGB function.







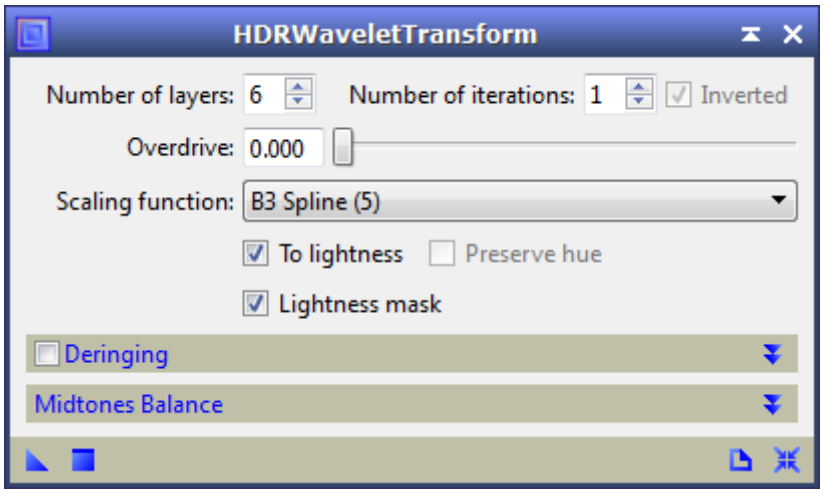
Don't forget to check "Chromatic Noise Reduction".

17) Scale the brightness of L

Increase the brigthness of the Luminance image step by step. Look at 13).

18) Darken the center of galaxy

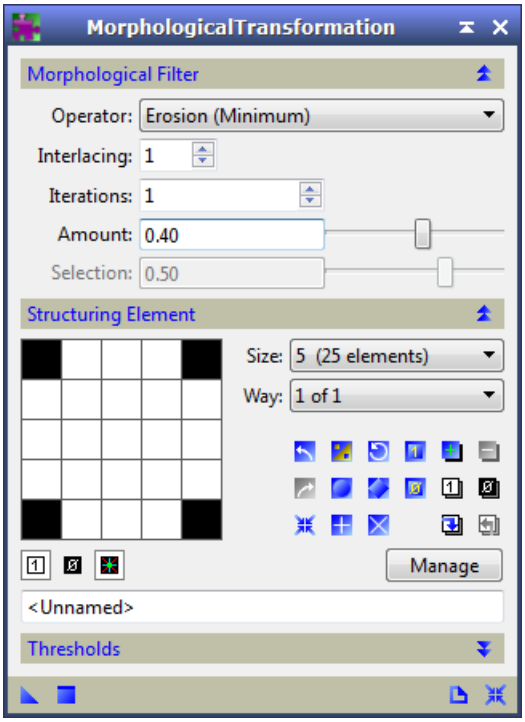
Generate a **star mask** with default values, invert it and put it to the image, before execute the HDRWaveletTransform.

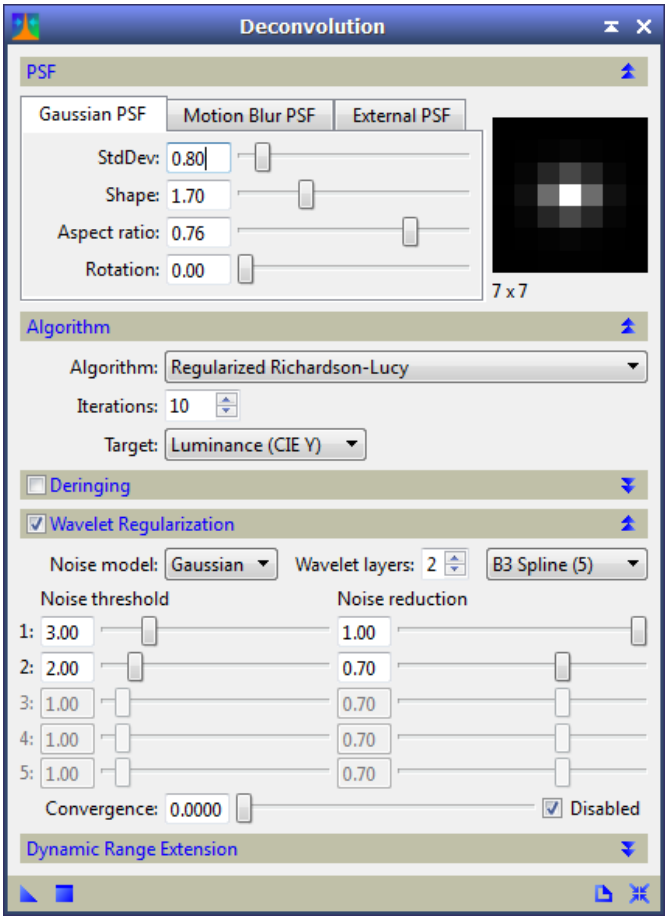


19) Make stars smaller

If the star mask of 18) is already on the image, invert it again or generate a new **star mask**.
Execute MorphologicalTransformation with parameter of below example. Then execute Deconvolution and then MorrphologicalTransformation again.

In this case the star shapes were not exactly round. For this reason the "Aspect ratio" was changed from 1 to 0.76.





20) Enhance Dark structures

If the center of galaxy has now a black value lower than 0.7, then increase the brithness a little bit like in step 13).

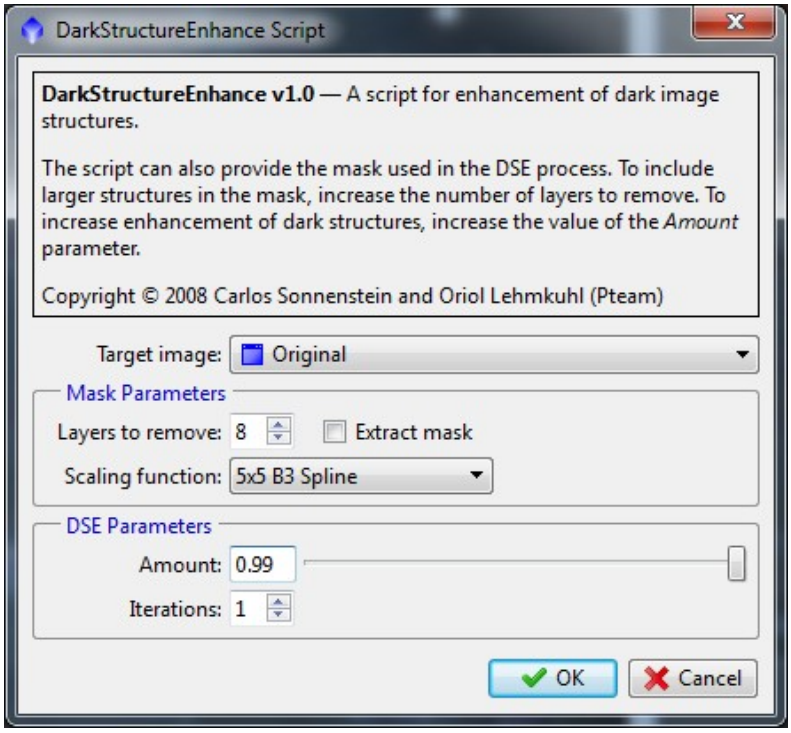
a) enhance middle size dark structures

Hipass radius=50, overlay 50%

- rename the image (double-click on the image name at left side) to "Original"
- generate 2 clones of the image
- rename "Original_clone1" to "Blend"
- Hipass filter to "Original_clone": ***Hipass_r50.xpsm***
- PixelMath: ***Original_minus_Clone.xpsm*** to image "Blend"
- put "Blend" to "Original" as Mask
- press the "Mask invert" button of "Original" 
- Pixelmath: ***Overlay_mult_factor_0p5.xpsm*** to image "Original"

b) darken big size dark structures

Don't remove the previous mask! We need it also for this step.



c) enhance fine dark structures

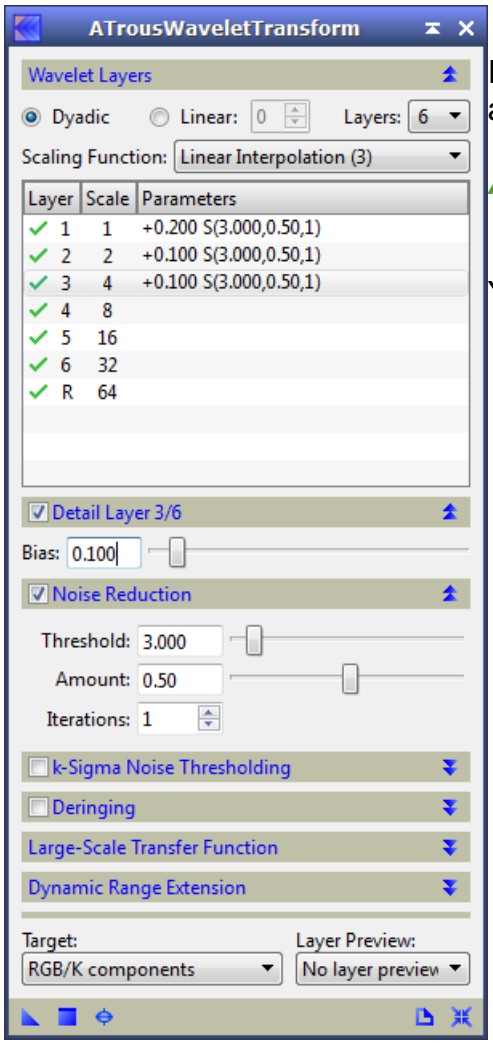
Hipass radius=30, overlay 30%

Same procedure as a), but with following processes instead:
Hipass_r30.xpsm
Overlay_mult_factor_0p3.xpsm

Sometime it make sense to darken the center of galaxy again, like in 18).

21) Sharpen of L

Generate a **star mask,** invert it and put it to the image.



In this case I changed the parameter of wavelets 1,2 and 3, but all with checked "Noise Reduction".

ATWT_Sharp.xpsm

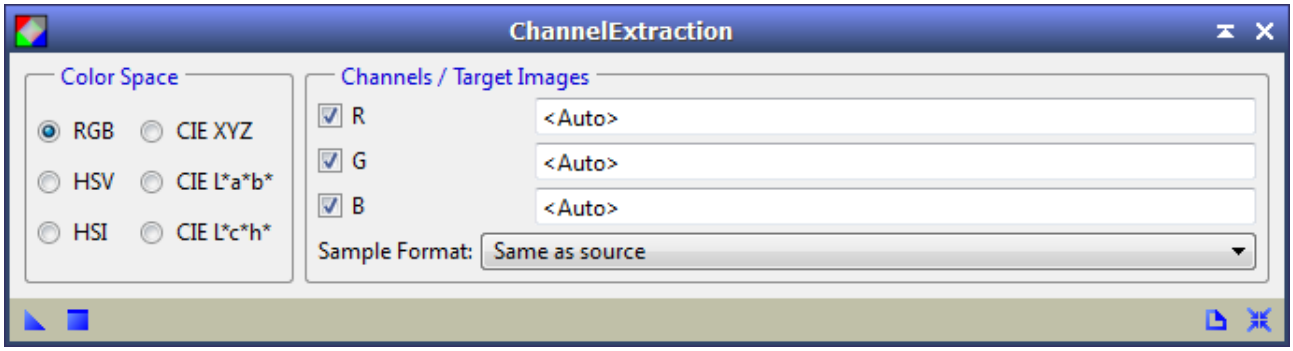
You have to find the best parameters for your image.

22) Remove hot- and darkpixel which are generated by previous processing

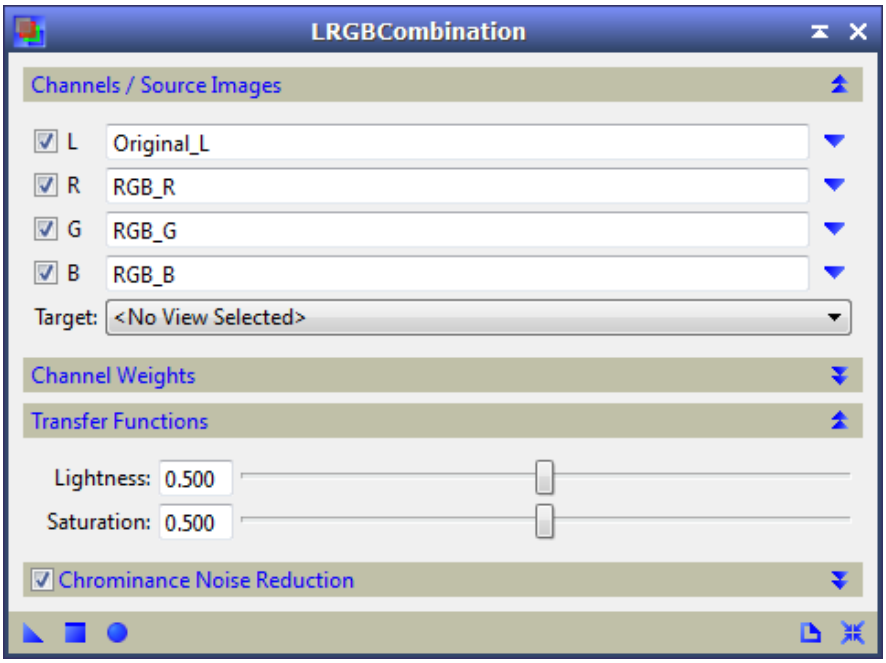
Sometimes new hot- and darkpixels are generated at the previous processes. In this case make step 5) again.
RemoveHotPixel.xpsm
RemoveDarkPixel.xpsm

23) Generate LRGB

Open the processed RGB image from step 16)
Extract the RGB channels.

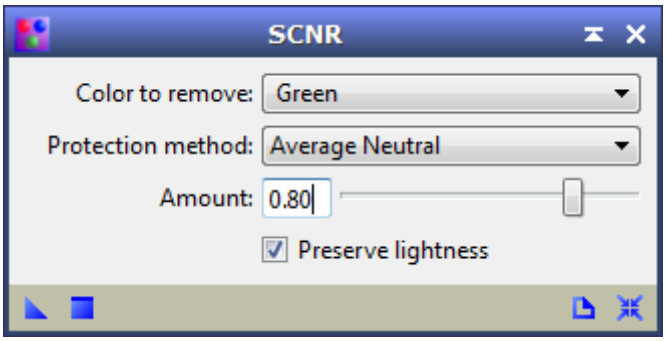


Generate the LRGB with "Chrominance Noise Reduction"



24) Remove unwished color tint

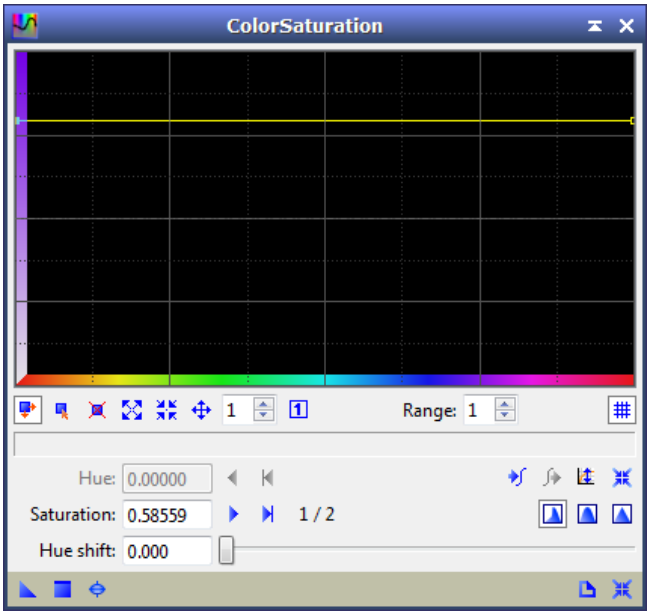
In this example there is a green tint in the image.



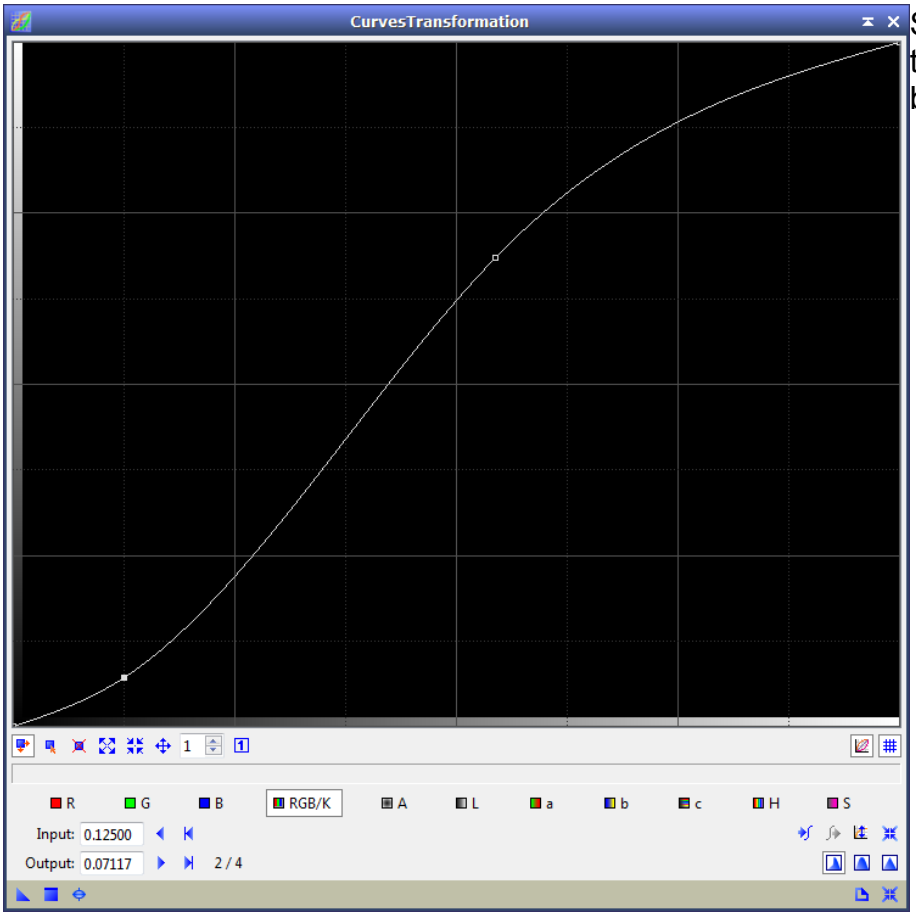
25) Increase color saturation

If the color saturation is too flat, increase it, but make a mask before to avoid background color spots:

- clone image
- "CurvesTransformation" with S-curve parameter to increase the contrast
- put it to the image as mask



26) Final curves transformation for wished brightness



Select the preview to find the best curve for brithness and contrast.

Result: