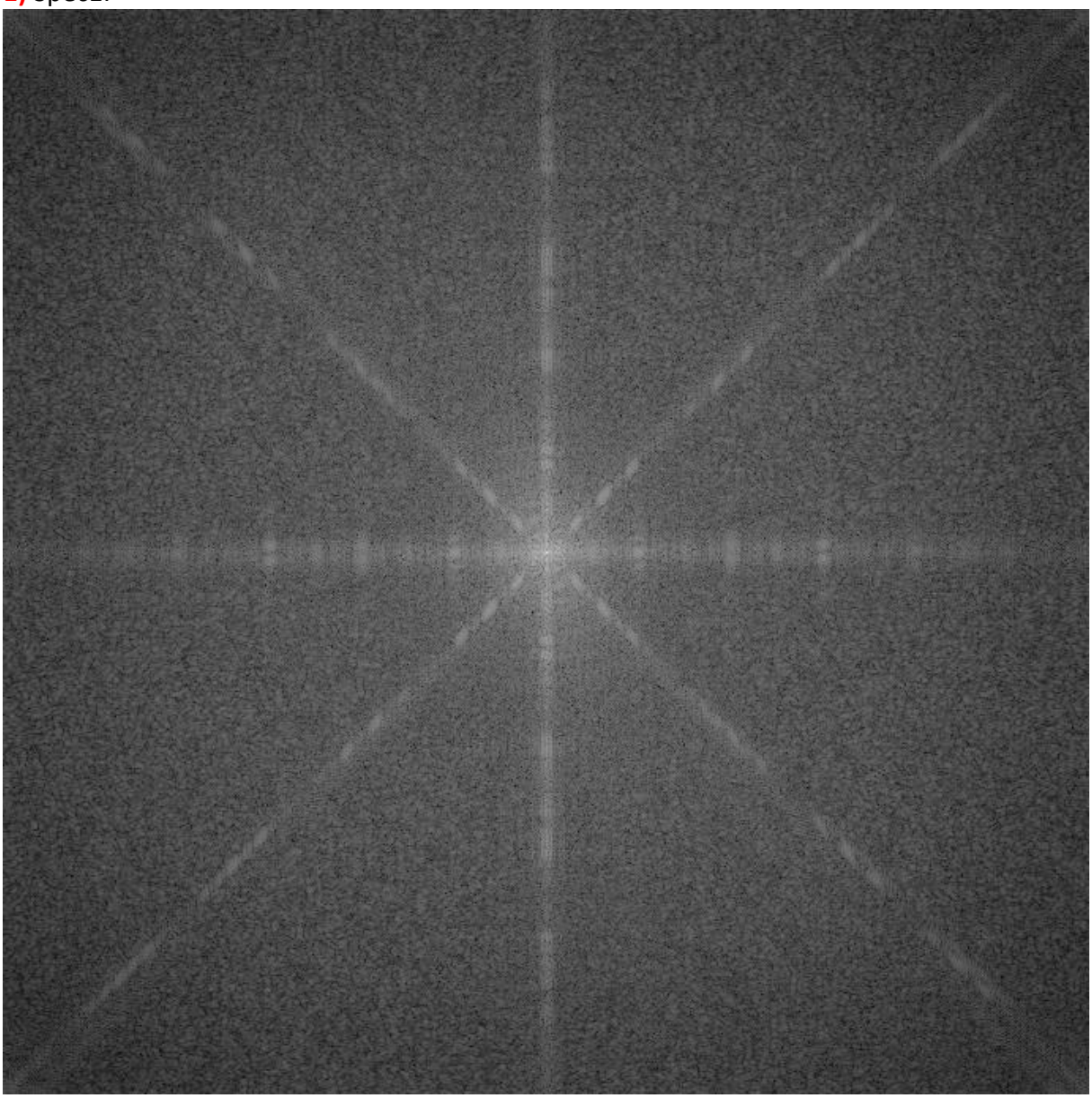
Lab 3. Task 1- preparation task
Template for answers

Save this document as a .pdf document before submitting.

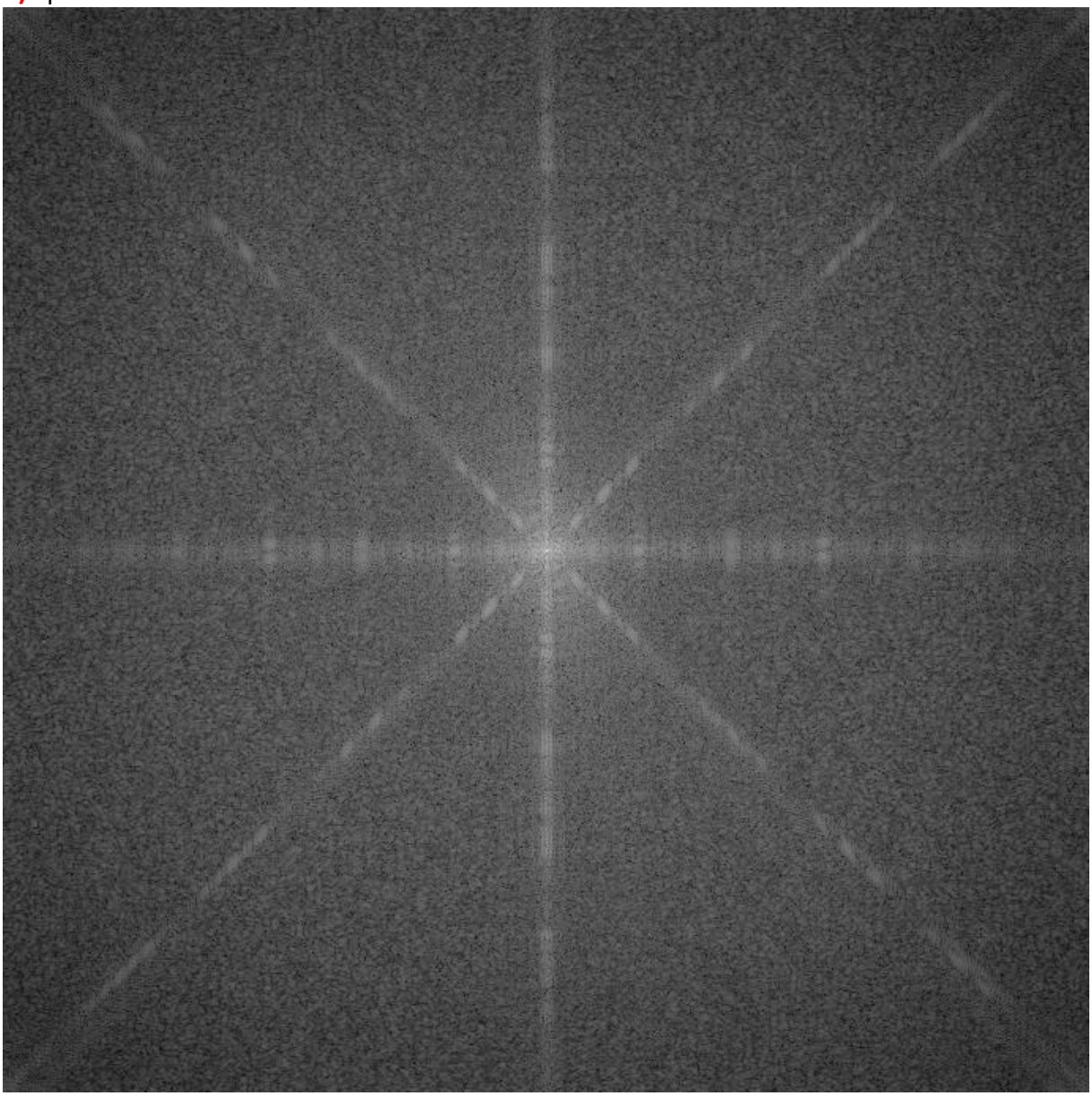
Student names and LiU-IDs: (Max 2 students per group):
1. Magnus Kling (magkl572)
2. Max Wiklundh (maxwi824)
Submission date:
Version (in case you need to re-submit):

1) 2D Fourier spectrum

1) Spec1:



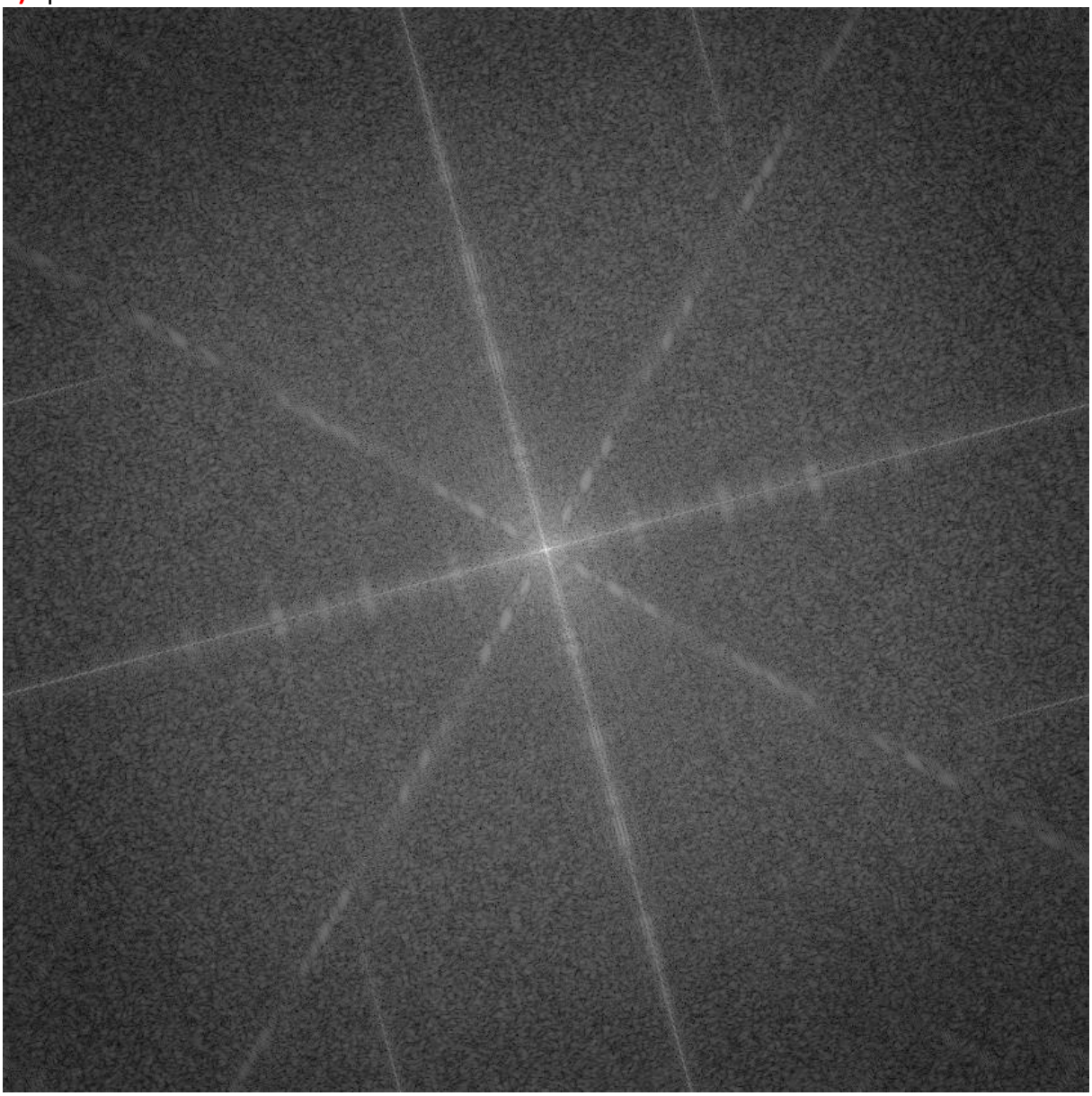
2) Spec2:



3) Are there any differences between $Spec2$ and $Spec1$? How does shift affect the spectrum of the Fourier transform?

The images contain the same data but Spec2 is shifted. Circshift only moves values in the image array but does not alter any, meaning the image has the same data but at slightly different positions. The images looks different in the spatial domain but are identical in the frequency domain.

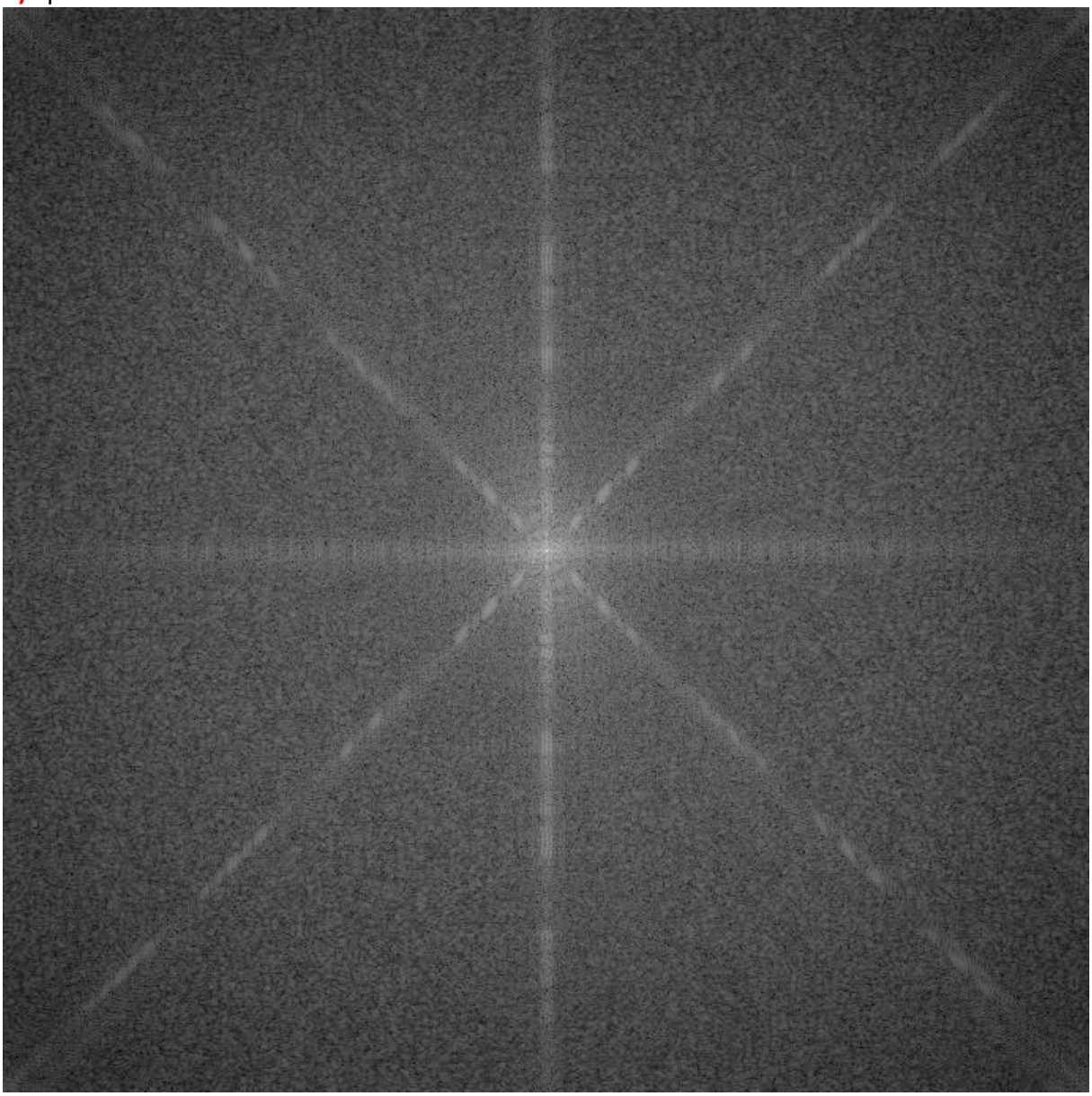
4) Spec3:



5) Are there any differences between $Spec3$ and $Spec1$? How does rotation in the spatial domain affect the Fourier spectrum? (Ignore some distortions caused by the black area around the image after rotation (cTP_rot))

The image has been rotated 15 degrees and this also applies in the frequency domain. The frequencies stay the same but are rotated. As example the vertical line in the middle is now leaning 15 degrees to the left.

6) Spec4:



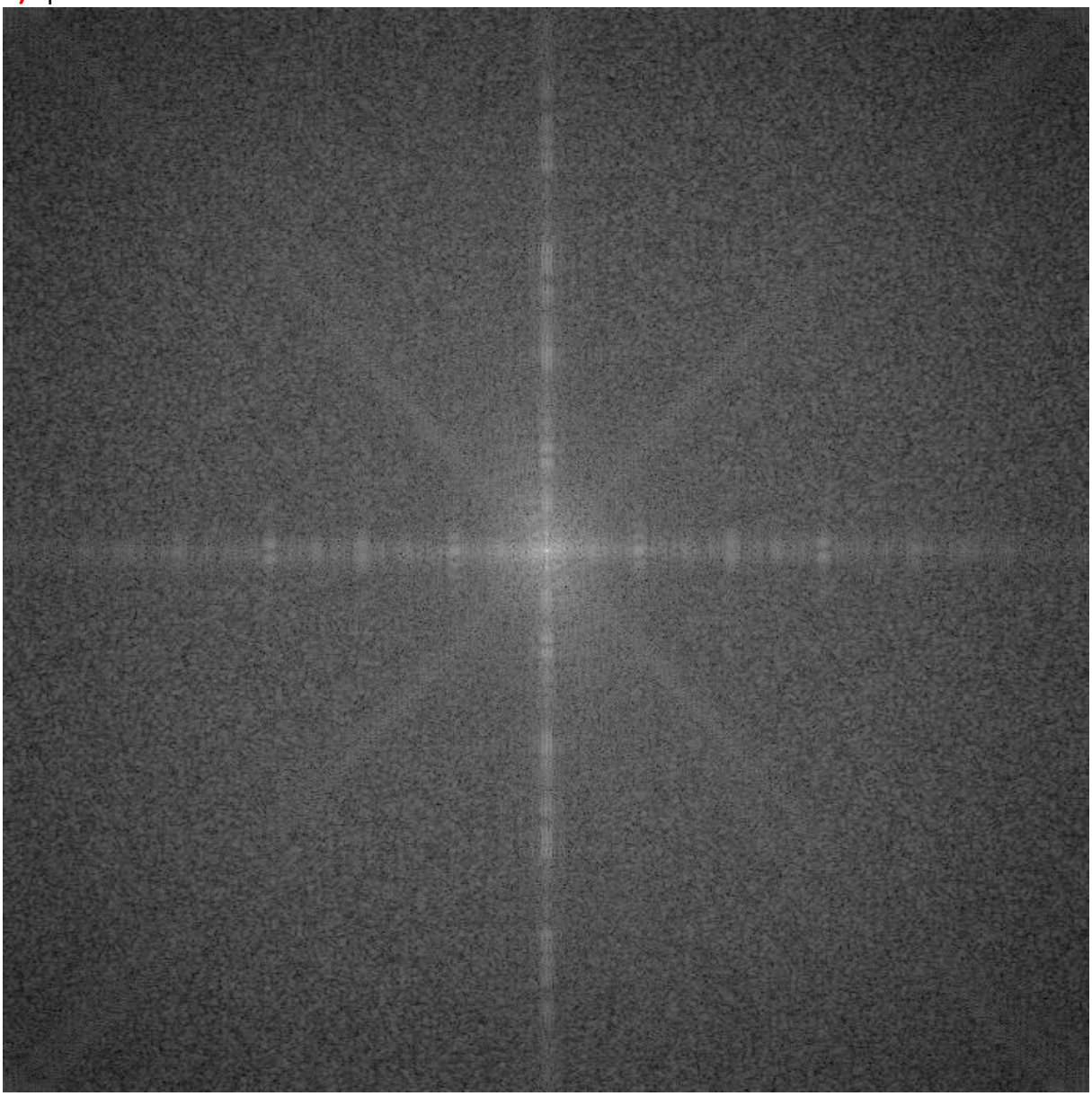
7) Compare $Spec4$ and $Spec1$ and explain how the elimination of vertical bars affected the spectrum. **HINT:** Look specially at the **horizontal** axes of the spectrum.

The horizontal axis is dimmer in spec4 compared to spec1 in the frequency domain because the vertical lines under the **a** are no longer there. This lowers the frequency in that axis, resulting in a dimmer horizontal axis.

8) Explain what would happen to the spectrum if the horizontal bars were eliminated from cTP?

The same thing would happen but on the vertical axis instead of the horizontal one.

9) Spec5:



10) Compare $Spec5$ and $Spec1$ and explain how the elimination of diagonal bars affected the spectrum. **HINT:** Look specially at the diagonal axes of the spectrum.

The periodic diagonal lines in the frequency domain are gone in spec5 compared to spec1 because the diagonal lines in the spatial domain are gone there is no longer a change in the diagonal axis, meaning the change in the frequency domain is almost 0.

2) Period and Frequency

11) Where would these three dominant peaks appear if $v2$ is transposed, i.e. if the vertical bars become horizontal?

Because P = 2 is the lowest possible which gives f = ½ meaning the 3 dominant peaks would be transposed to: the top edge, middle and bottom edge on the vertical axis. The DC term stays the same.

12) What is the frequency of these stripes? Where would the three dominant peaks in the spectrum for this image appear?
P = 4 gives f= ¼ = 0.25 cycles/pixel which means the dominant peaks will be: in the middle and the two others will be in the middle between the DC and right edge or left edge on the horizontal plane.

13) What is the frequency of these stripes? Where would the three most dominant peaks in the spectrum for this image appear?
P = 300 gives f=1/200 which would make the dominant peaks be right next to the DC-term, on either side.

3) The importance of the spectrum and the phase angle

14) E1_E2:

15) E2_E1:

16) Is the spectrum or the phase angle that has more effect on the structure of an image based on your visual analysis of the above results?

The phase angle has a larger effect on the structure because it is very easy to see compared to the spectrum.

*Don't forget to save the document as **.pdf** before submitting!*