

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. Emil Alsbjer, emial133

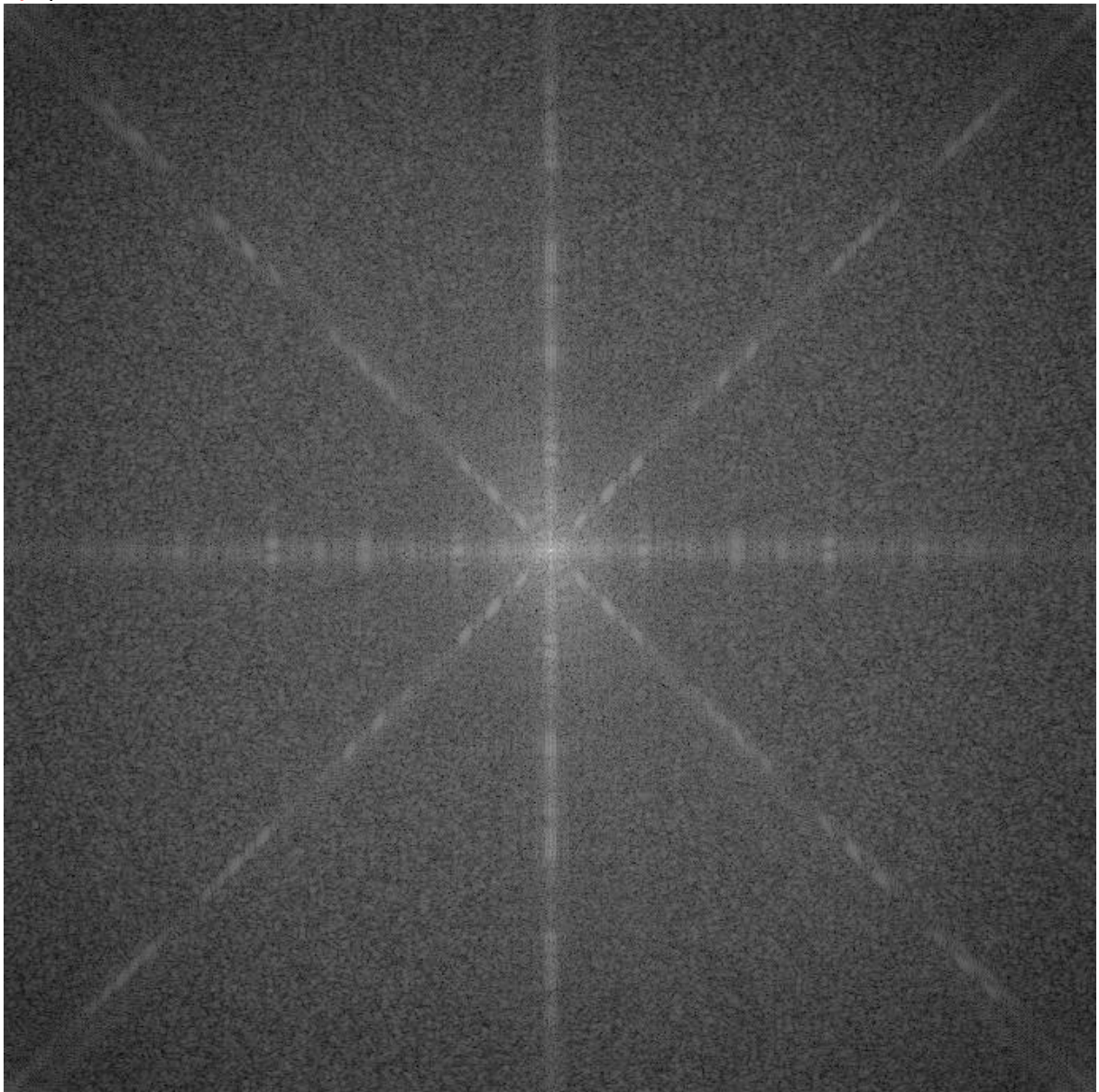
2. Victor Ström, vicst918

Submission date:

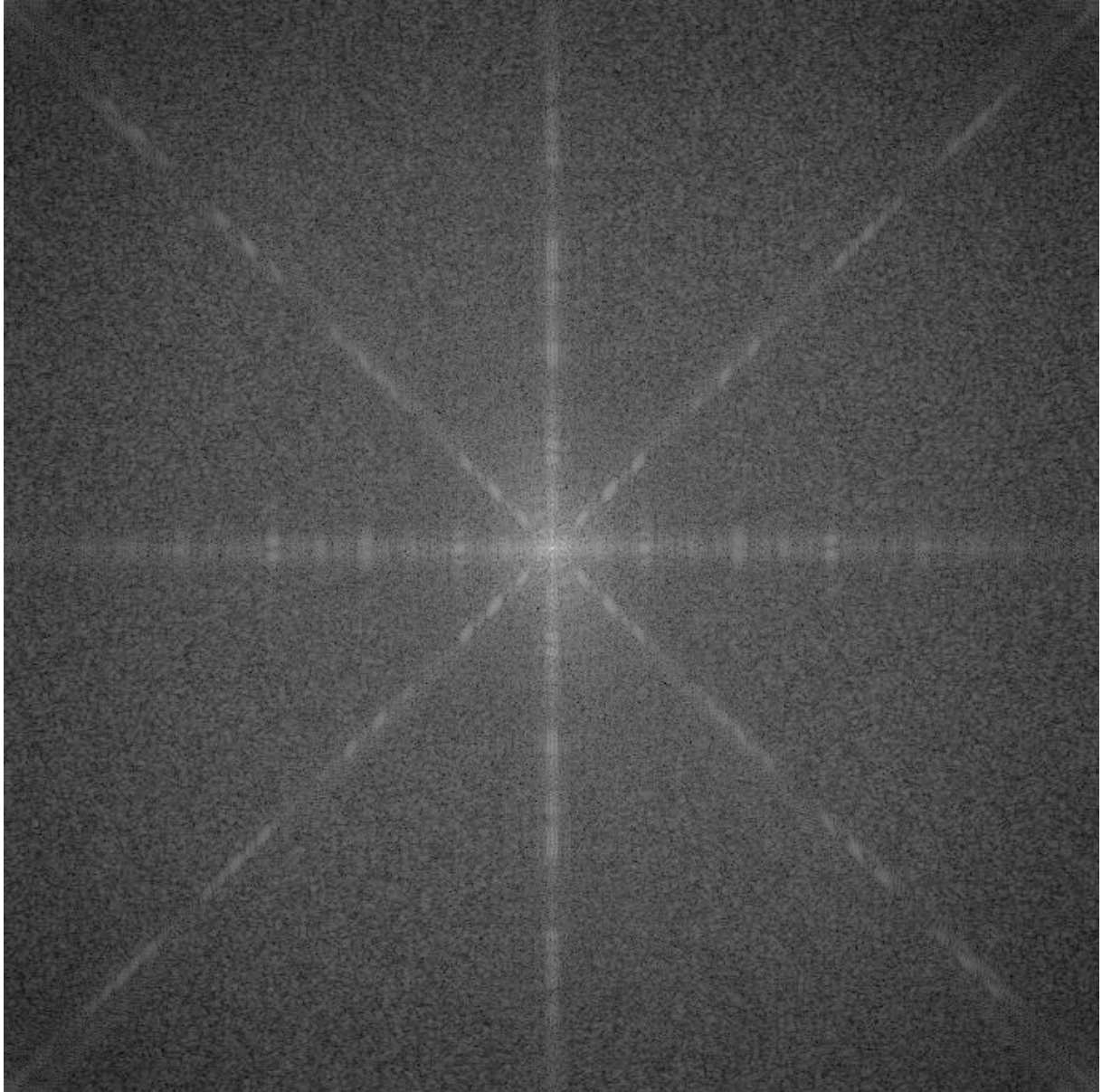
Version (in case you need to re-submit): 1

1) 2D Fourier spectrum

1) Spec1:



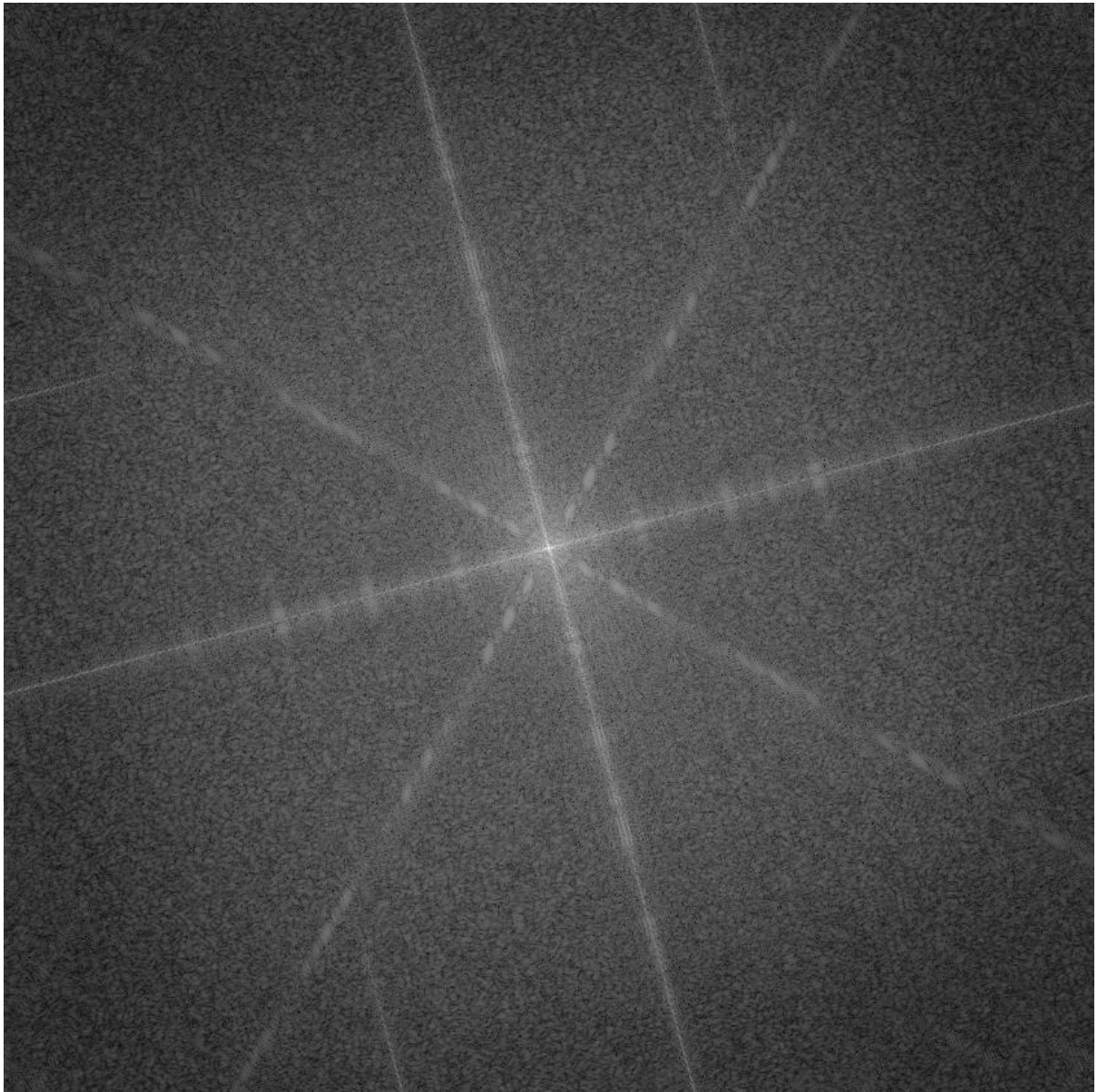
2) Spec2:



3) Do you notice any differences between *Spec2* and *Spec1*? How does shifting the image affect the Fourier spectrum?

There is no difference between *Spec1* and *Spec2*. The information we gain from $\text{Log}(1+\text{abs}(F))$ doesn't say anything about the phase of the spectrum. So when we do circshift we won't get any new information.

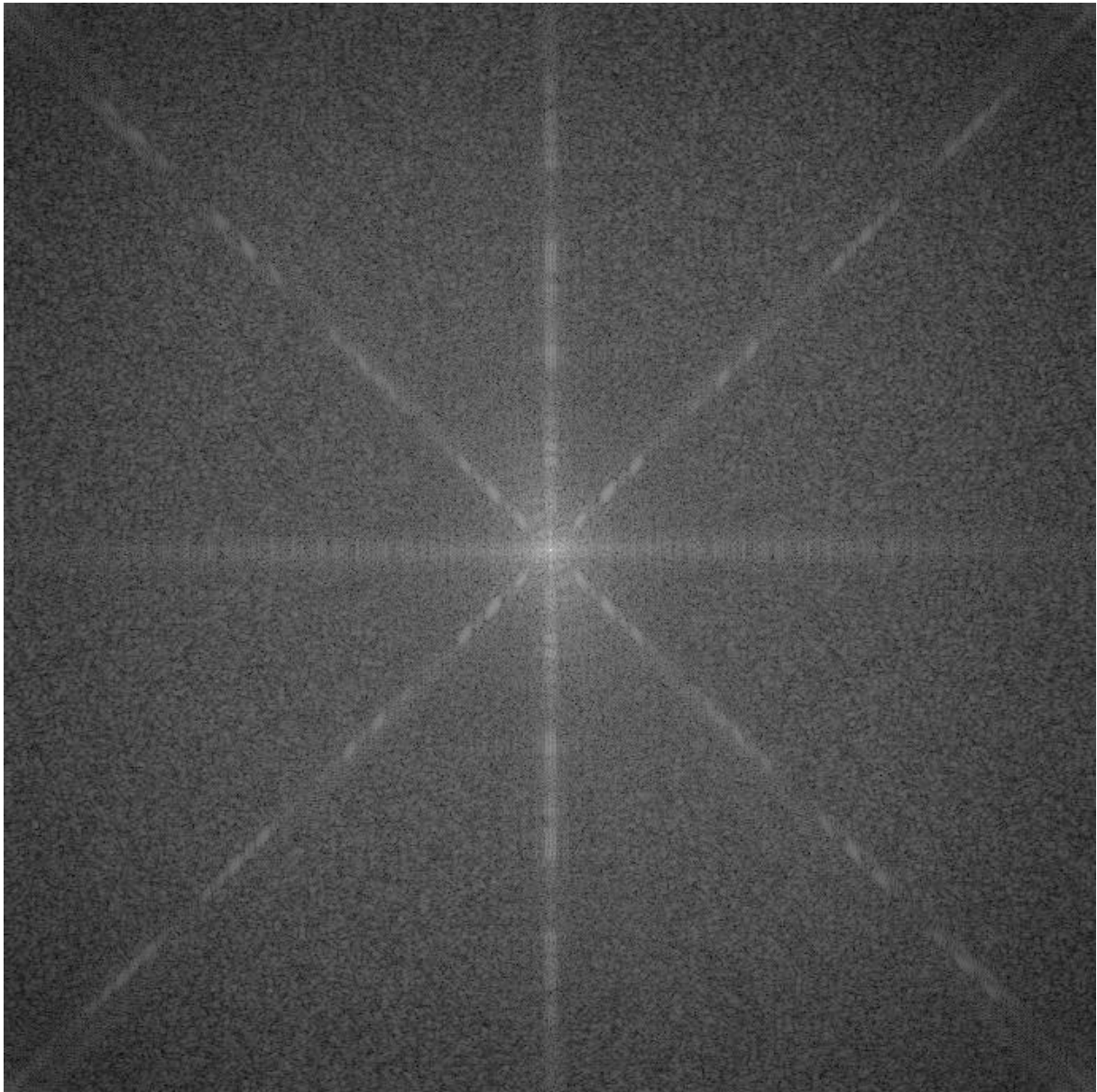
4) Spec3:



5) Do you notice any differences between *Spec3* and *Spec1*? How does rotation in the spatial domain affect the Fourier spectrum? (Please ignore any distortions caused by the black area added around the image after rotation.)

Rotating the image in the spatial domain will also rotate the spectrum image. Edges have moved to other locations in the image. However the magnitude is still unaffected.

6) Spec4:



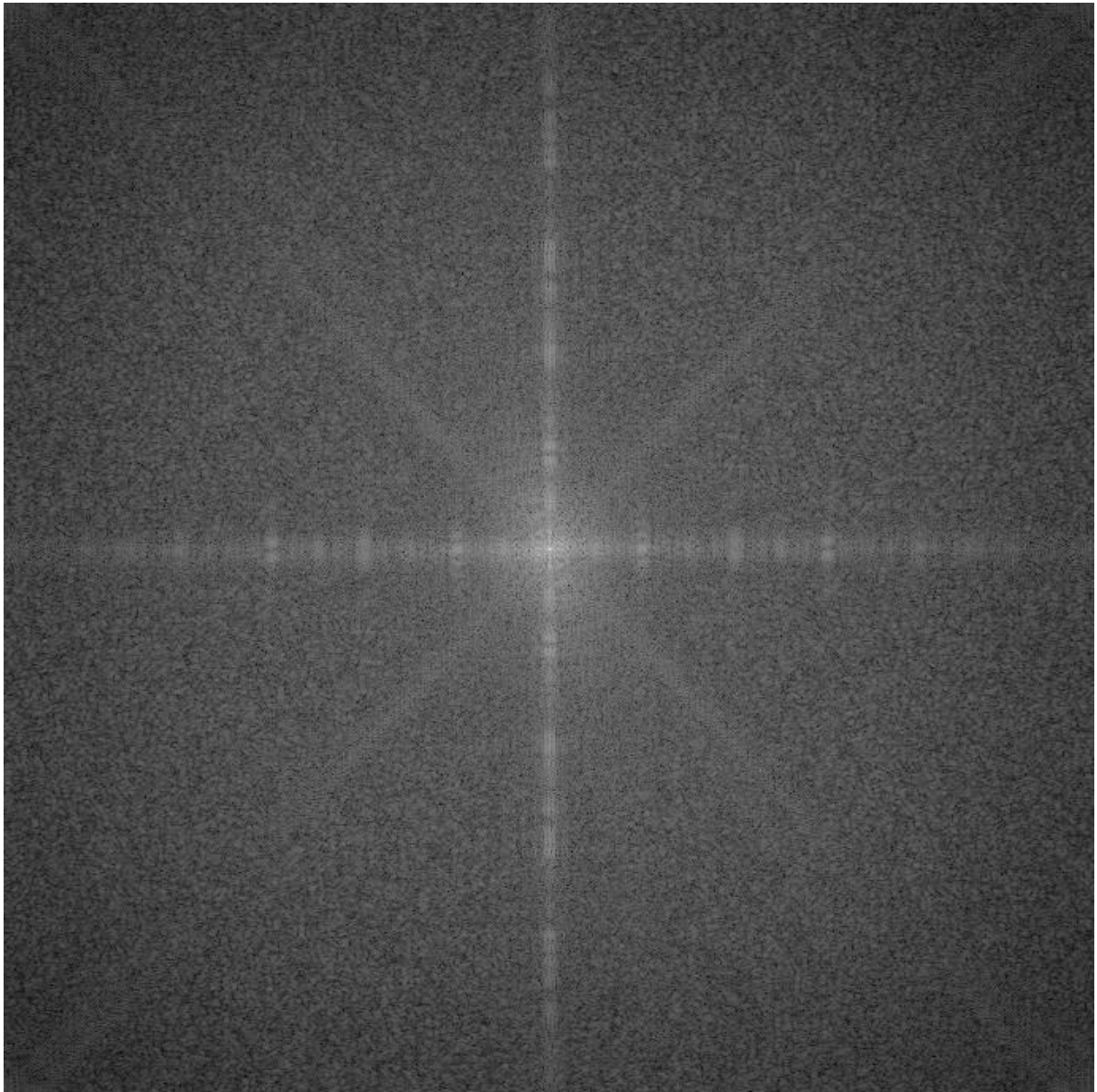
7) Compare *Spec4* with *Spec1* and explain how the elimination of the vertical bars affected the spectrum.

Removing information from the image in the spatial domain will have an effect on the spectrum image. We can see that the horizontal line has less intensity compared to the horizontal line on the first spectrum image. Considering the vertical bars were removed we conclude that the horizontal line represents frequencies that are vertical lines in the spatial domain.

8) Discuss what would happen to the spectrum if the horizontal bars were eliminated from *cTP*.

Vertical components would be removed from the spectrum.

9) Spec5:



10) Compare *Spec5* with *Spec1* and explain how the elimination of the diagonal bars affected the spectrum.

The spectrum is not changed

2) Period and Frequency

11) Where would the three dominant peaks appear if the image *v2* is transposed, meaning the vertical bars become horizontal?

Still one in the middle, one to the left of the image and one the right. Same y-value but different x- value

12) What is the frequency of the stripes in *v4*? Where would the three dominant peaks in the spectrum for this image appear?

*Frequency = $1/p$ which for *v4* gives $\frac{1}{4} = 0.25$*

13) What is the frequency of these stripes? Where would the three most dominant peaks in the spectrum for this image appear?

With $P = 300$ all three dots would be in the middle of the image

3) The importance of the spectrum and the phase angle

14) E1_E2:



15) E2_E1:



16) Based on your visual analysis of the results from Problems 14 and 15, which has a greater effect on the structure of an image: the spectrum or the phase angle?

Phase has greater effect on the on the structure of the image. There is more "contribution" of the secondary image.

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