CLAIMS:

1. An Exit Pupil Expander, EPE, grating divided into at least two segments,
comprising a first segment and a second segment, wherein each of the first segment and second segment comprises a plurality grating bars,
wherein the grating bars of the first segment and the grating bars of the second segment have identical grating structures,
wherein said grating bars of the first segment being directed about to a same direction as said grating bars of the second segment and misaligned in a direction which is perpendicular to the direction of the grating bars of the second segment,
wherein said grating bars of the first segment and the second segment are misaligned to cause light rays propagating along different paths in the EPE grating to undergo different phase shifts due to said misalignment.

2. An EPE grating according to claim 1, wherein each of said multiple grating bars in the second segment is offset compared to a corresponding grating bar in the first segment by a distance in the direction which is perpendicular to a direction of the grating bars.

3. An EPE grating according to claim 2, wherein a first grating bar of the first segment is the corresponding grating bar of a first grating bar of the second segment and a second grating bar of the first segment is the corresponding grating bar of a second grating bar of the second segment.

4. An EPE grating according to claim 2 or claim 3, wherein the distance is less than a period of the EPE grating.

5. An EPE grating according to any of the preceding claims, wherein each of said multiple bars in the second segment is offset from a corresponding grating bar in the first segment by the distance in a lateral direction.

6. An EPE grating according to any of the preceding claims, wherein each of said multiple bars in the second segment is offset from a corresponding grating bar in the first segment by the distance in a vertical direction.

7. An EPE grating according to any of the preceding claims, wherein the EPE grating is doubly periodic.

8. An EPE grating according to any of the preceding claims, wherein the first segment of the EPE grating is arranged to cause a first phase shift to a light ray deflected in the first segment and the second segment of the EPE grating is arranged to cause a second phase shift to a light ray deflected in the second segment.

9. An EPE grating according to claim 8, wherein the first phase shift is different compared to the second phase shift.

10. An EPE grating according to claim 8 or claim 9, wherein an amplitude of the light ray deflected in the first segment is the same as an amplitude of the light ray deflected in the second segment.

11. An EPE grating according to any of the preceding claims, wherein the second segment is subsequent to the first segment for a light ray guided to the EPE grating.

12. An EPE grating according to any of the preceding claims, wherein the EPE grating further comprises multiple grating bars in a third segment and each of said multiple bars in the third segment is offset from a corresponding grating bar in the first segment by a distance in a direction which is perpendicular to a direction of the grating bars.

13. An EPE grating according to any of the preceding claims, wherein a distance between subsequent grating bars of the first segment is the same as a distance between subsequent grating bars of the second segment.

14. An EPE grating according to any of the preceding claims, wherein the EPE grating is arranged to spread and couple light out of the EPE grating, and preferably also arranged to operate as an in-coupler.

15. An EPE grating according to any of the preceding claims, wherein the EPE grating is arranged to keep an amplitude of light rays propagating through different paths in the EPE grating as unaltered.

16. An optical waveguide arrangement for displaying an image, comprising:

- an optical waveguide;
- an in-coupling grating for diffractively coupling the image into the optical waveguide;
- an out-coupling grating for diffractively coupling the image out of the optical waveguide; and
- an EPE grating according to any of the preceding claims, wherein the EPE grating is between the in-coupling grating and the out-coupling grating for expanding the exit pupil of the image on the out-coupling grating,

wherein said in-coupling grating and said out-coupling grating are misaligned to cause light rays propagating along different paths in the EPE grating to undergo different phase shifts.

17. A personal display device, such as a head-mounted display, HMD, or head-up display, HUD, comprising an optical waveguide arrangement according to claim 16.