

Analysis of Effect of Perturbations in SWHM and Illuminating Optical Scheme Parameters on Aerial Images

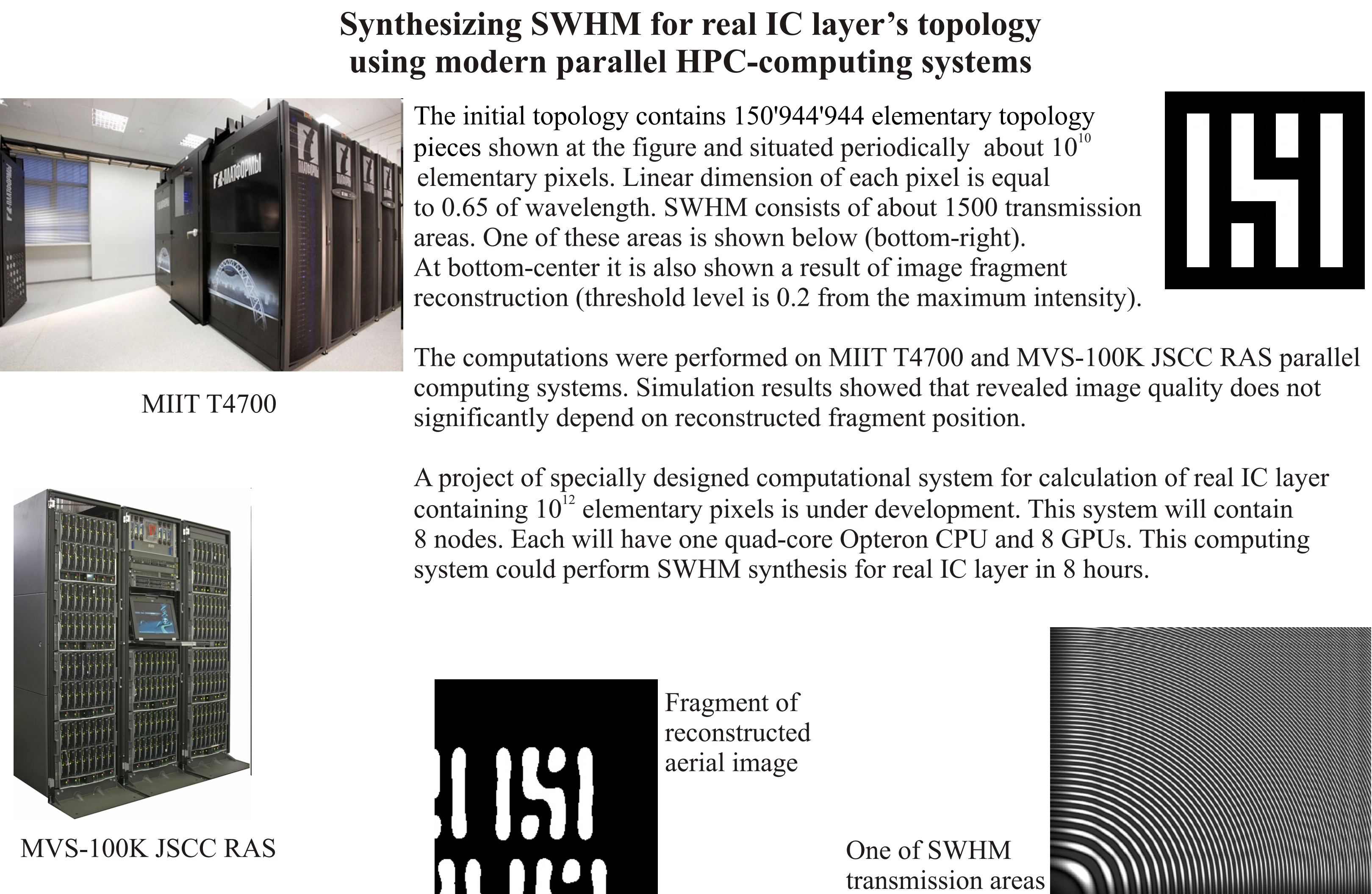
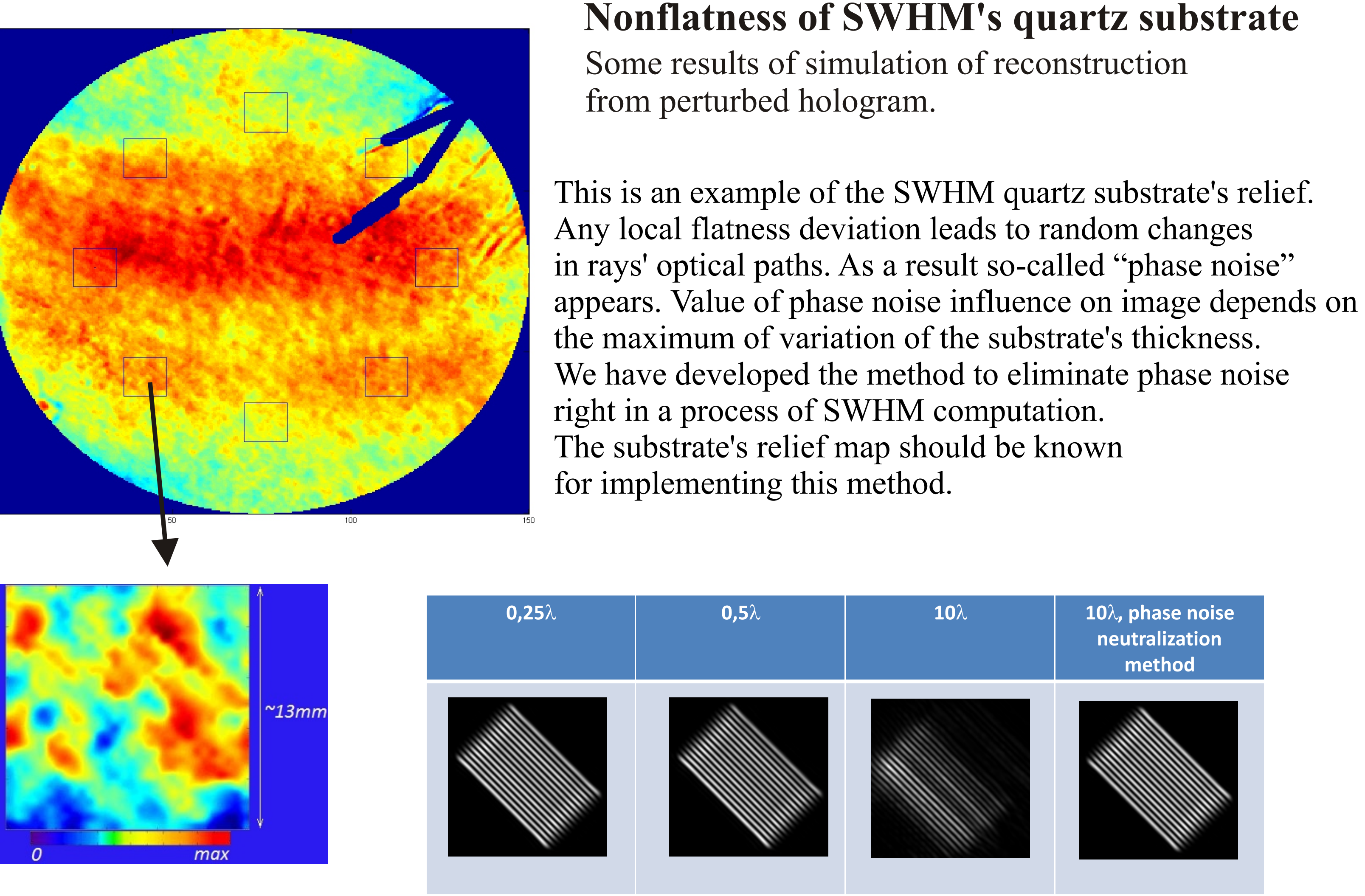
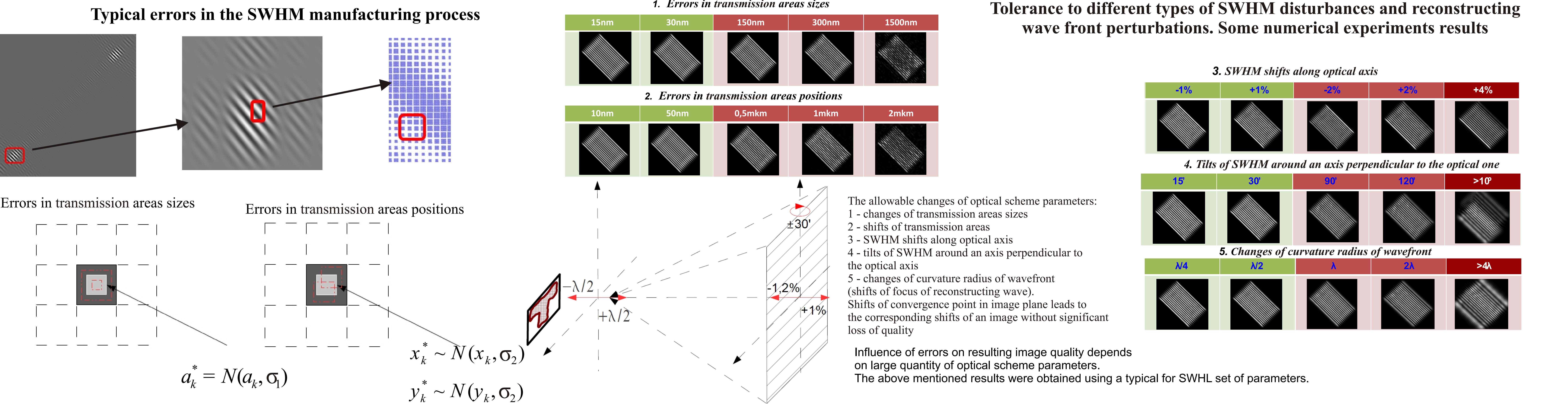
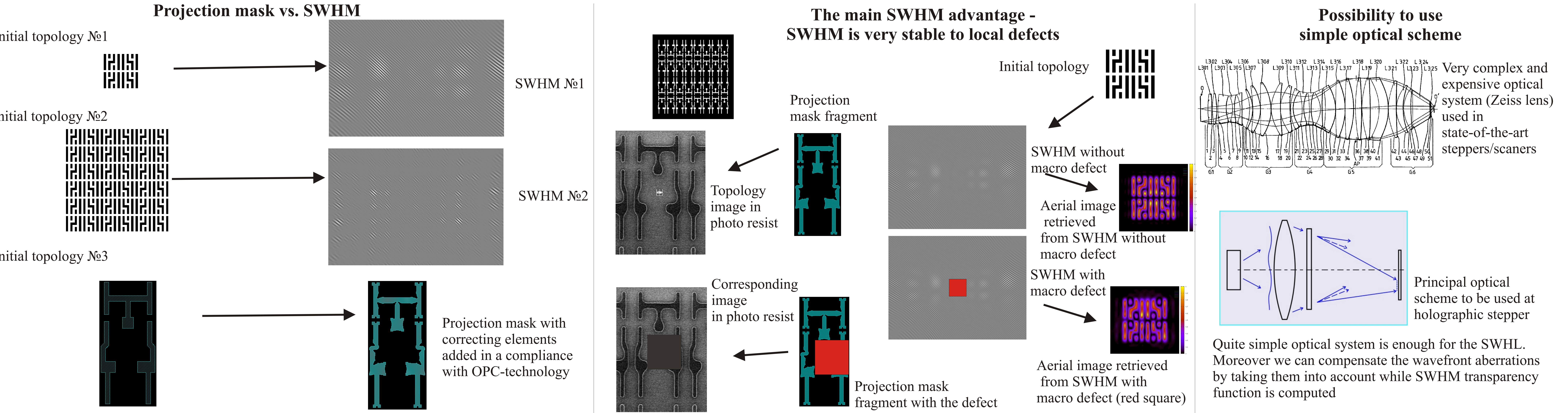
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An aerial image created with the help of SWHM is very stable to local defects of SWHM. This radically simplifies the processes of mask production and operation and makes local defects detection and correction unnecessary.

Inaccuracies of modern e-beam lithography systems used for SWHM manufacturing are considerably smaller than the values that are critical for providing the desired quality of aerial image created by SWHM. The only possible exception is disturbance caused by phase noise appearing as a result of substrate non-flatness. However it appears to be rather small if quartz substrate non-flatness varies sufficiently smoothly, which is true for every polished surface. Such disturbances could be completely eliminated by measuring substrate non-flatness profile and taking it into account in computing SWHM transparency function.

A new method for IC aerial images creation - sub-wavelength holographic lithography (SWHL) is introduced. We propose to use very stable to local defects holographic patterns and very simple optical scheme for photoresist exposure. The paper considers the influence of different disturbances on resulting topology image. Such disturbances could appear either in the process of SWHM manufacturing or in the process of reconstructing a given topology in photoresist with the help of SWHM.

Numerical simulation of aerial image production process with the use of SWHM under different disturbances shows that image quality is very stable against different typical disturbances. It turned out that acceptable values of the considered disturbances depend on reconstructing radiation wave-length with some coefficient proportional to the SWHM-to-image-size ratio. Meanwhile transparency function disturbances caused by binarization could be minimized by using the developed calculation method. The acceptable rate of local deviations of forms, sizes and centers coordinates for SWHM transmission areas proved to be rather high.



References

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Conventional OPC and Virtual HoloOPC

