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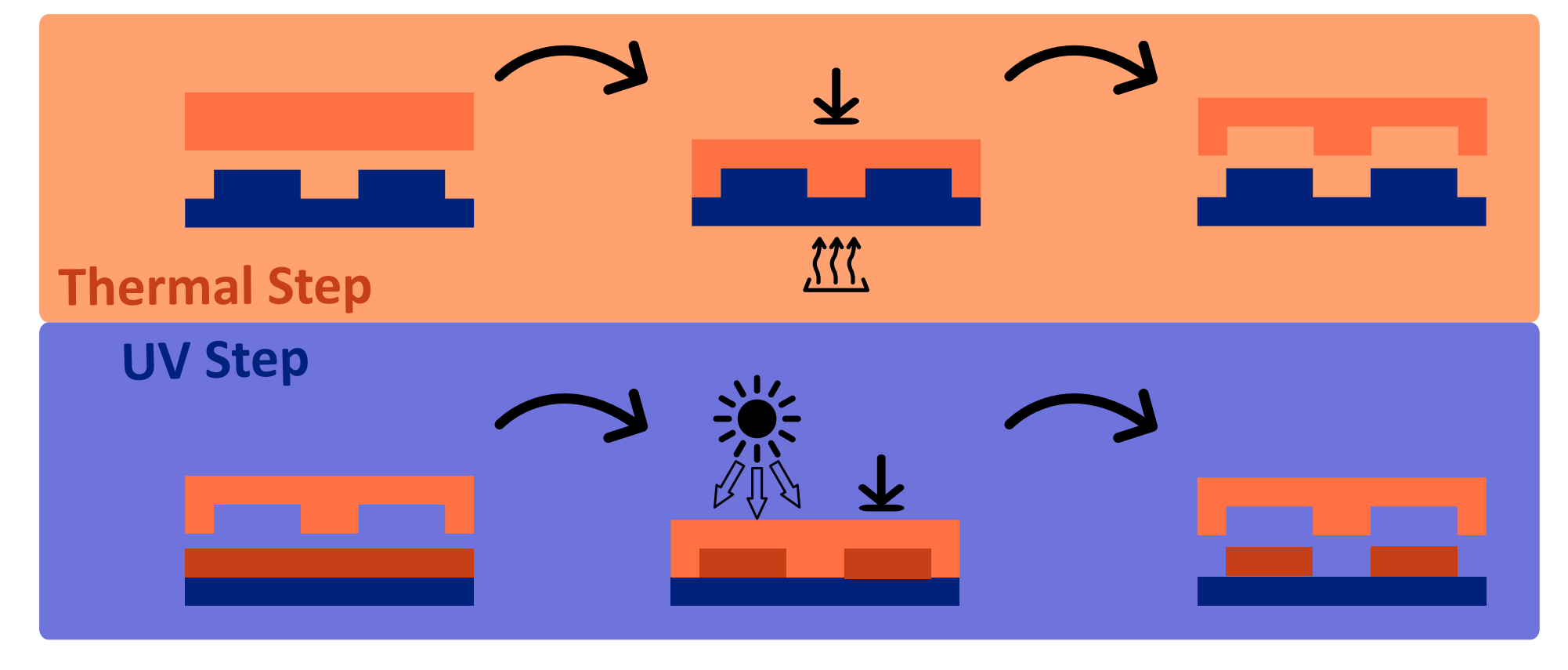
Distortion pre-compensation in soft nanoimprint process for mix-and-match process with traditional UV lithography

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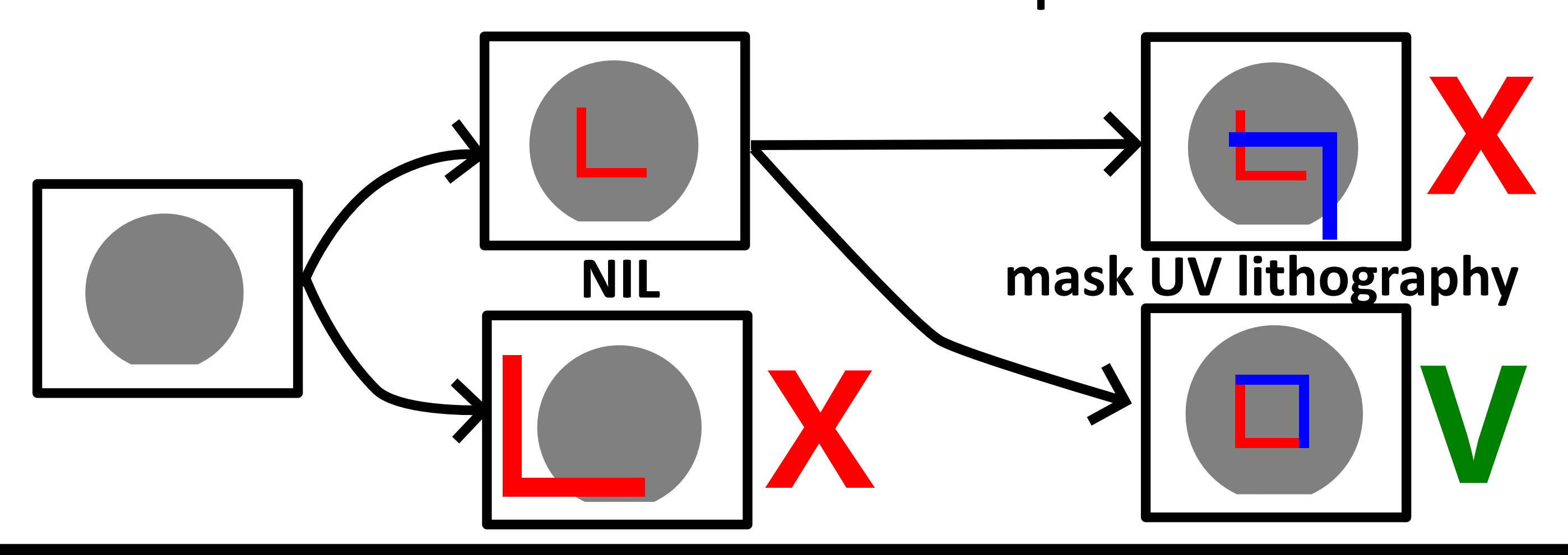
What is NIL ?

Nanoimprint lithography (NIL) consists in replicating a nano scale pattern by stamping the master mold onto the receiving substrate. Soft NIL process consist of using an intermediate soft mold to avoid breaking the master mold. In our case, this mold is hot embossed.

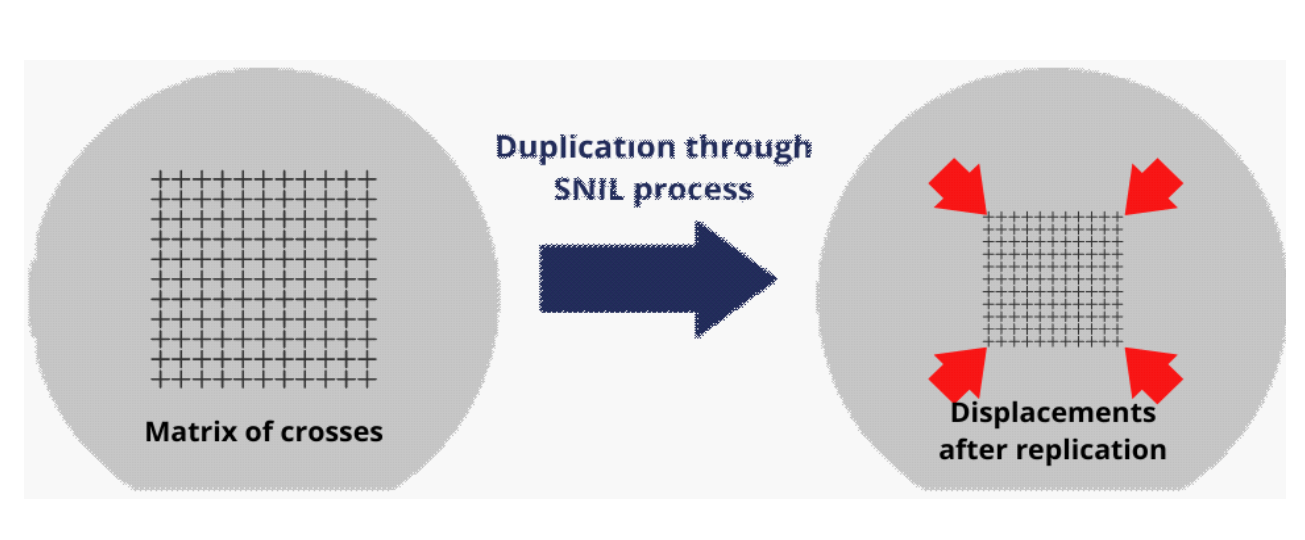


The challenge of mix and match

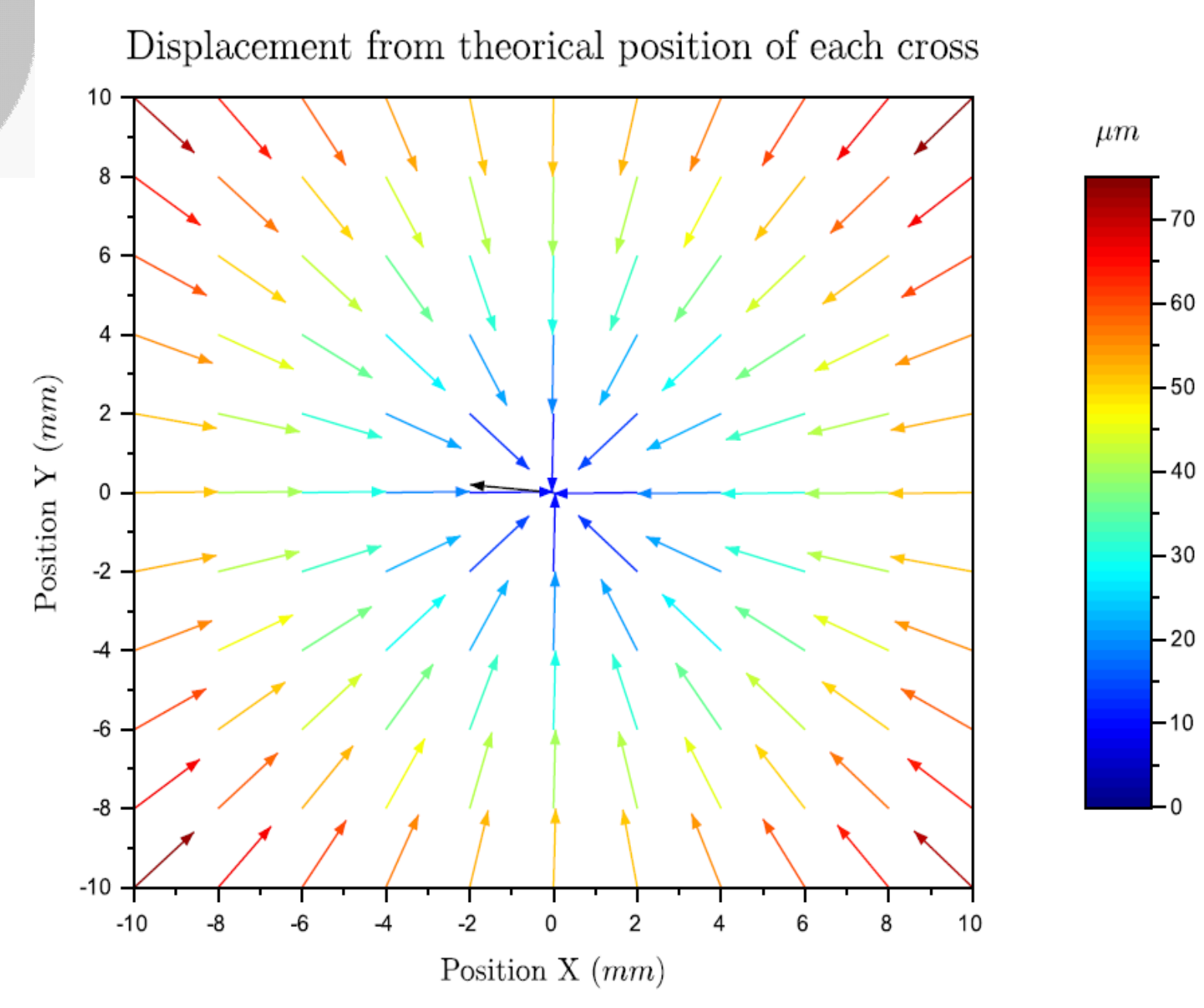
The use of SNIL in mix-and-match processes is limited due to distortions induced by the thermal step. The resulting precision isn't sufficient when compared to UV-lithography precision. This work aims to identify a method for compensating these regular distortions and to determine match the precision of classic UV-lithography.



Absolute displacement

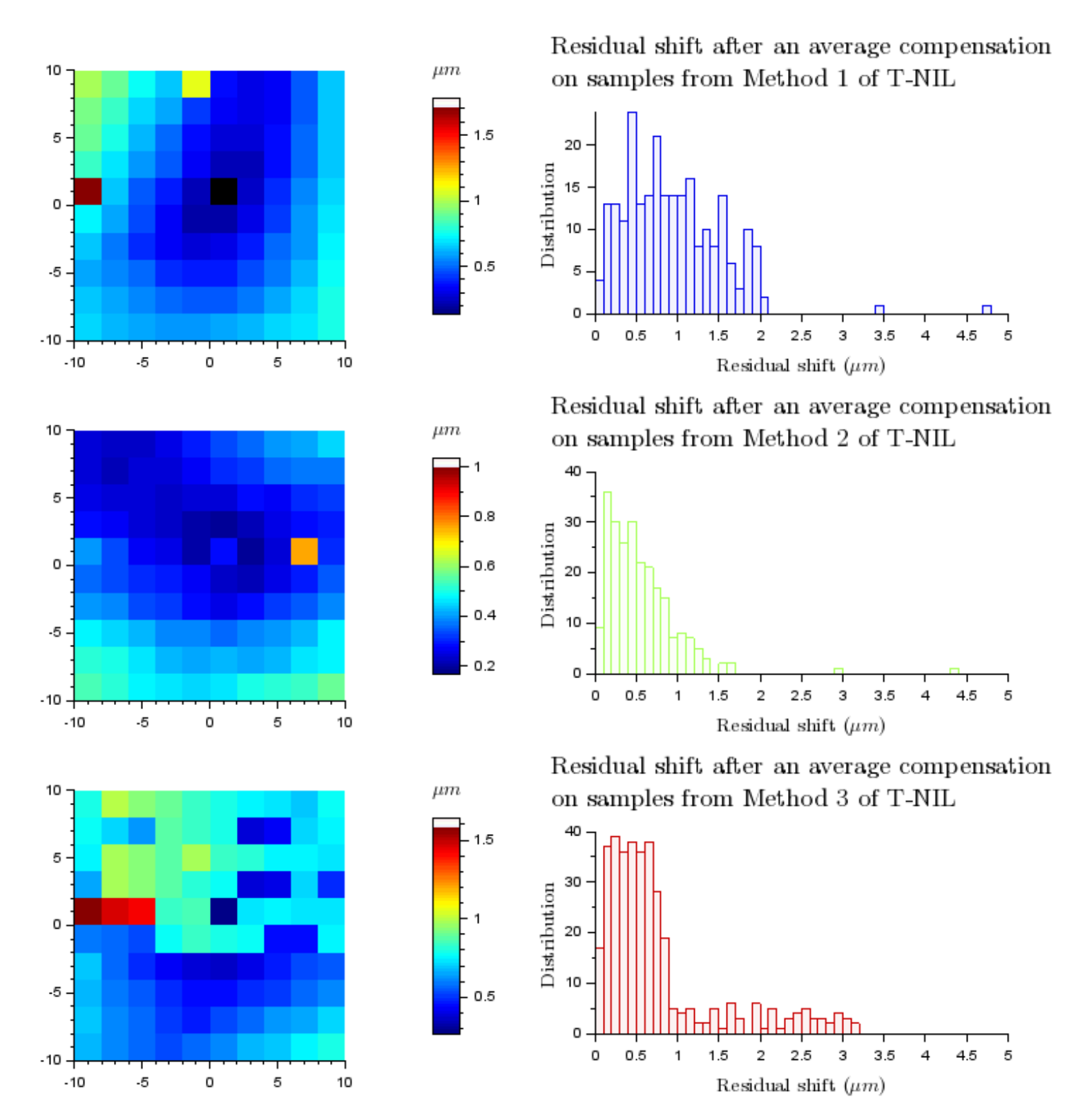
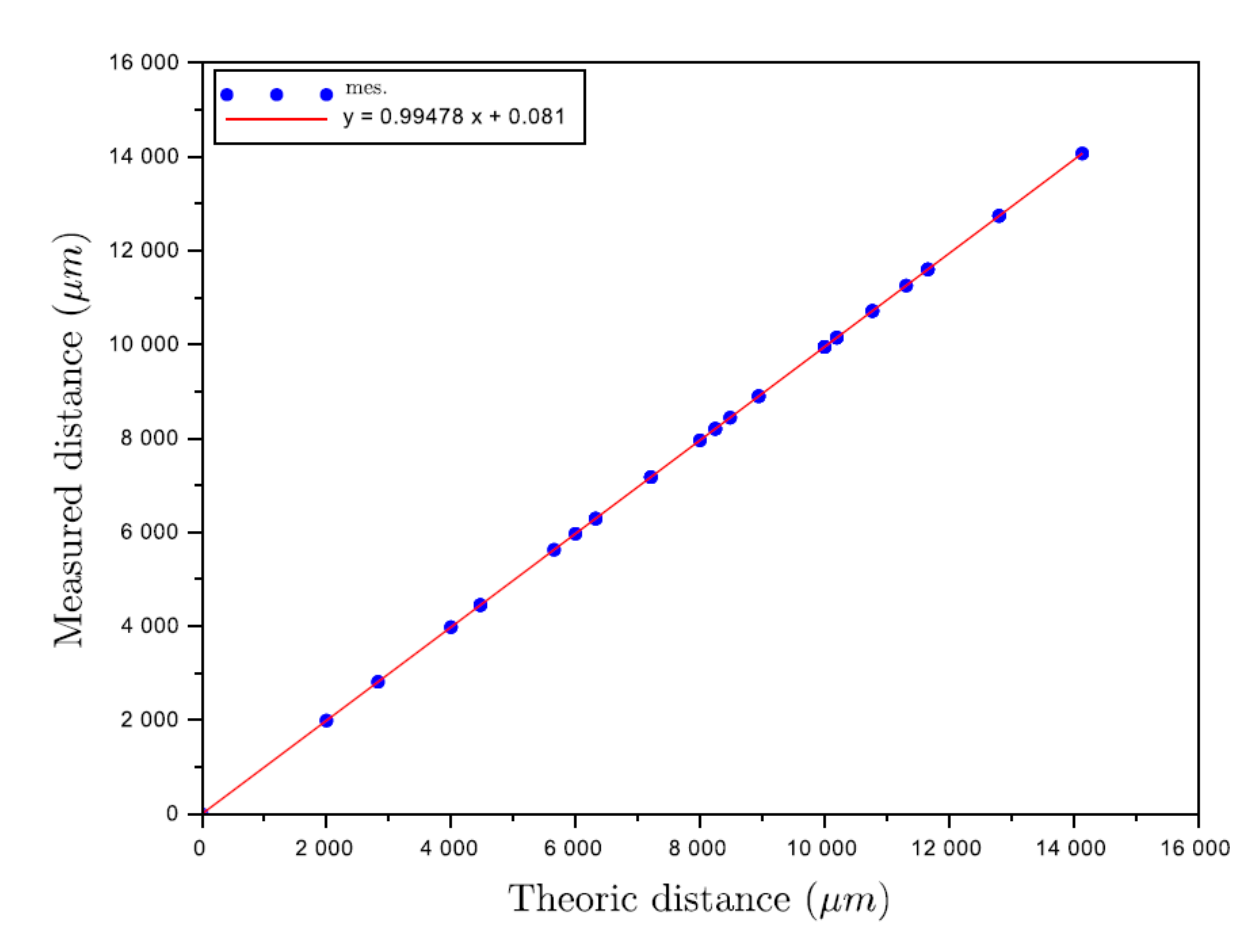


Absolute displacement refers to the **distortion of each pattern on the replicated substrate compared to its position on the master mold**, using the central cross as the origin for both.

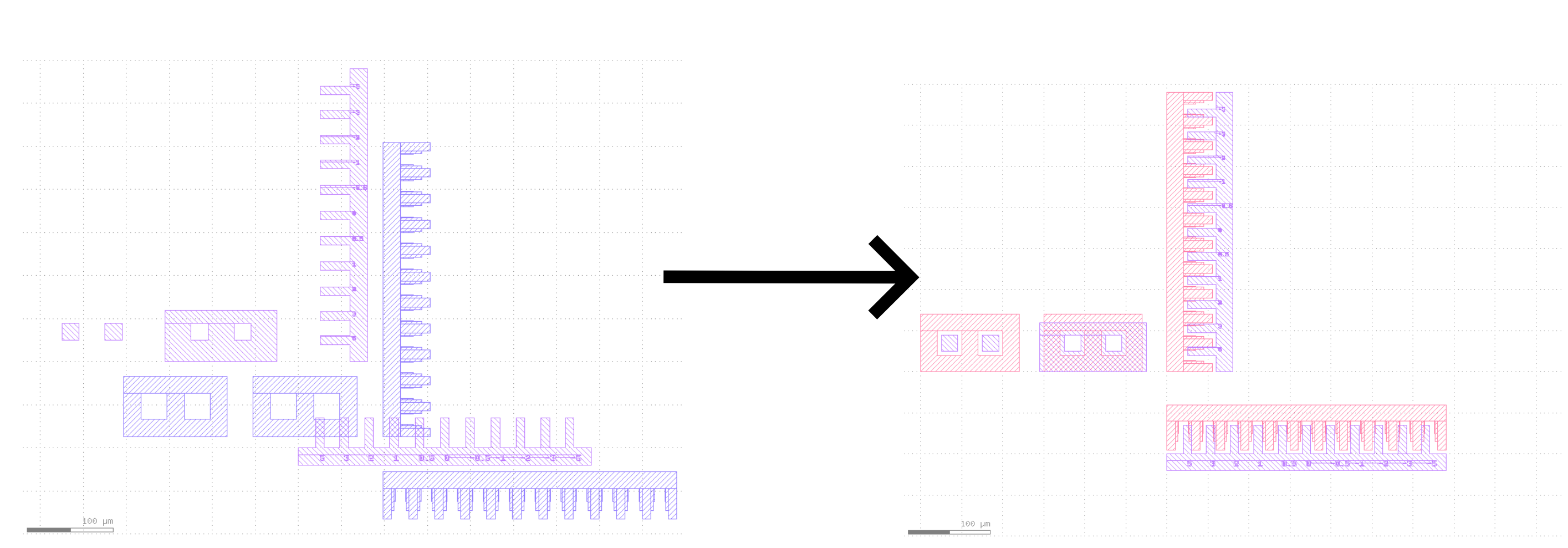


By comparing the cross positions before and after replication, we determine a **homothetic distortion coefficient linked to the thermal dilation of the master mold and polymer stamp**.

Removing this homothetic distortion allows us to predict the residual distortion and **design a pre-compensated mold**

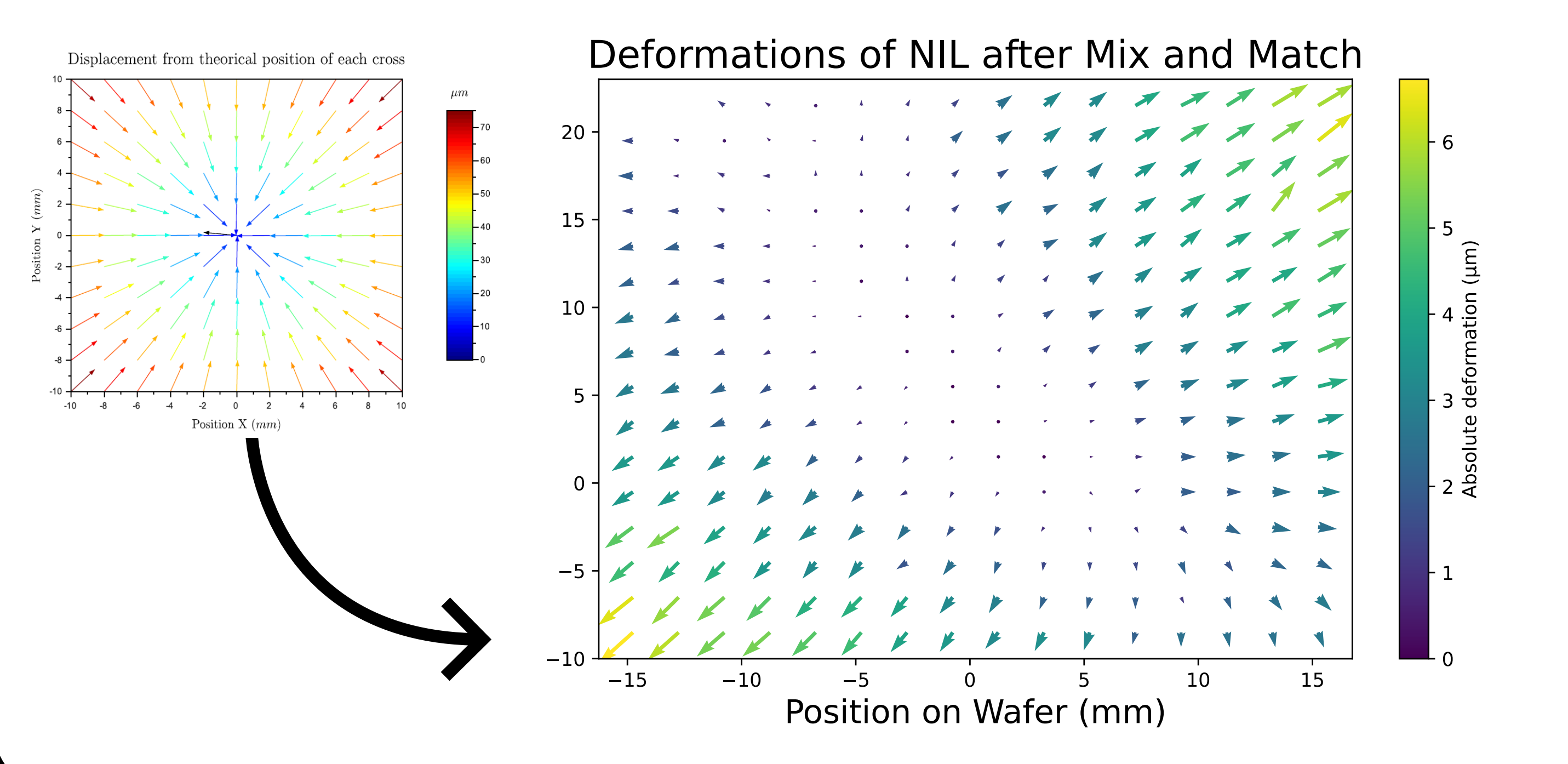


Relative displacement



Using the distortion map obtained via the previous analysis, we are able to fabricate a precompensated mold where each pattern is distorted. Using a 20x20 mm² area of microscopique vernier, we are able to determine the realignment precision from a SNIL imprinted pattern to a classic mask photolithography.

Using this method we are able to **reduce the displacement by ten fold their original impact**



What's left to do ?

This analysis method is quite cost effective as it only requires a microscope with an automatic picture-taking system. However the data processing is limited to the lecture of the vernier by the user. The **use of automatic reading and mapping of verniers** would allow for **statistical analysis**, determining even better precompensated patterns

