



Target Reference Points to Spots

This sciFLEXARRAYER technology allows for nonorthogonal grid spotting relative to a reference point within the target. From the reference point, relative positions inside the target are defined as parameters of the task. The absolute position of the spots are then defined via image recognition of a defined marker; two or more equal markers are preferred to account for rotation. Head camera position and calibration are critical for this task.

Case study

A.P.E. dual biosensor (Advanced Placement for Electrodes, LLC) has a horseshoe patterned spot area (Figure 1A). Image based positioning utilizes features within the chip and allows for the use of 'Target Reference Points to Spots' to obtain reproducible printing across multiple chips.

Target Teaching

In this case study, Nozzle Head Camera wizard was first performed to calibrate the distance between the nozzle and the center of the head camera. This step is critical to ensure spotting accuracy. In the Target Reference Points to Spots software tab, the template was then defined with the center of the head camera image at the teach corner location. After the head camera was

moved to the target, a rectangular template was selected with the teach corner located in the center of the image (Figure 1B). The “learn” and “search” functions were then performed to teach the software the template and test the ability of the software to recognize the template, respectively. The software accurately identified the template with a score of 964. The template was then saved and loaded into the software.

Target and Field Set Up

In the Target Setup tab, the field was defined as a 10x10 array. This allowed for a maximum of 100 spots to then be defined within Target Reference Points to Spots.

Spot Coordinates

To accommodate a non-orthogonal grid spotting pattern, the relative spot coordinates were defined using the head camera in relation to the teach corner. The coordinates for each spot were then entered into the table within the Target Reference Points to Spots function (Figure 2). Once all necessary parameters were defined, Task Creator was used to save the Target Reference Points to Spots configuration as a task. The resulting task was then incorporated into a spotting run and QC was performed to assess the accuracy of spotting. All spots were deposited in accordance with coordinates defined in the Target Reference Points to Spots task and successfully passed QC (Figure 3).

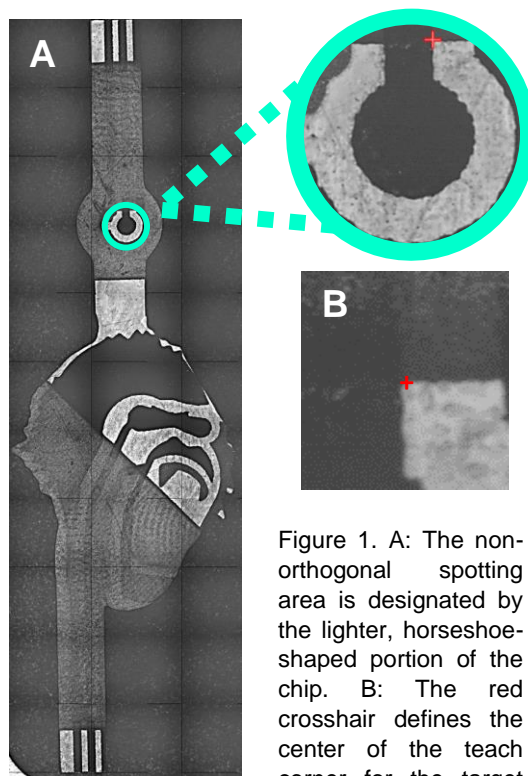


Figure 1. A: The non-orthogonal spotting area is designated by the lighter, horseshoe-shaped portion of the chip. B: The red crosshair defines the center of the teach corner for the target substrate.



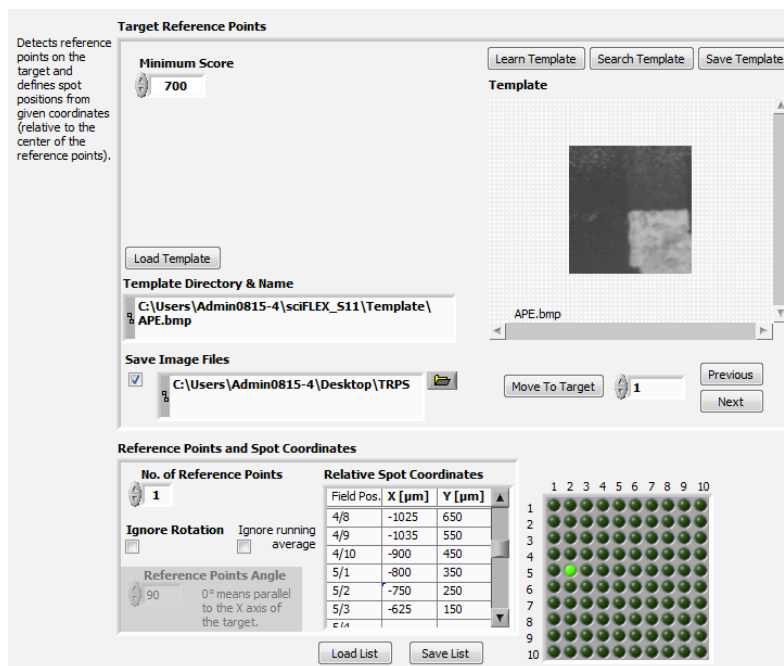


Figure 2. A: Setup of Target Reference Points to Spots. The template image and relative coordinates of each spotting position are defined and saved within the software.

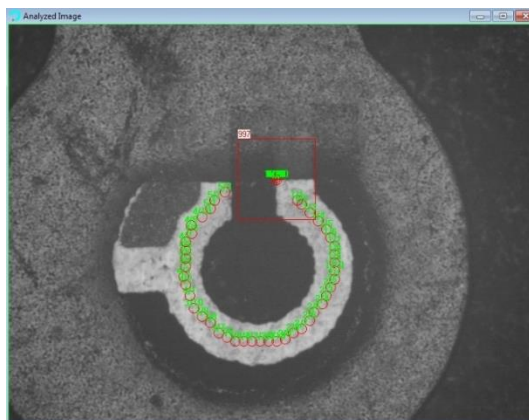


Figure 3. A: Demonstrative image post-spotting. The template image was identified with a score of 997. All spots were deposited according to the coordinates defined with Target References Points to Spots and were accurately identified by QC.

Conclusion

The sciFLEXARRAYER function, "Target Reference Points to Spots", allowed for the horseshoe pattern spotting region to be accurately deposited on the biosensor. The image recognition algorithm integrated into this software feature drastically reduces the time needed to execute runs and provides precise dispensing across multiple targets. The utilization of this technology can greatly enhance efficiency, by reducing errors and improving the allocation of time and resources, while also allowing for customization of non-standard spotting arrays.

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