Technical Bulletin

SPOT-F (SPOT-on-the-FLY) - spotting technology to speed up array production

Introduction:

Current sciFLEXARRAYER´s spotting occurs in two distinct steps: move to a location, stop and dispense, move to a new location, stop, and dispense again.
This worked fine for a wide range of applications, but with new throughput requirements in array production e.g. increasing production speed, a new spotting technology was developed. Named SPOT-F (Spot-on-the-fly), it is enabled on SCIENION´s production systems: sciFLEXARRAYER S100 and sciFLEXARRAYER SX.

Setup / Printing:

The drive mechanisms present in SX and S100 systems allow a direct connection of the Pulse Unit with the motor encoders. This enables trigger pulses, and drop ejection, without having to stop. Spotting takes place exactly at the moment the nozzle moves over the target – hence the name SPOT-F (Spot-on-the-fly).
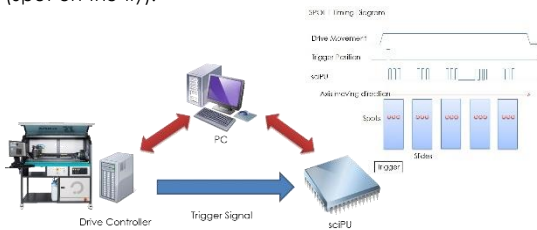

Figure 1. SPOT-F Routine: PC sends the position to the drive controller on which a trigger signal is generated. sciPU is armed (No. of spots, frequency, gaps sent). The movement is started. The drive controller sends the trigger signal to the sciPU once the axis has passed the defined position. The sciPU starts dispensing.

SPOT-F is only possible at the final speed of the drive. The drive start moving before it starts dispensing and it needs some space after the last spot for deceleration. One drive (X or Y) can give a trigger signal per movement. If tilt angles of the targets have to be corrected (both drives move simultaneously), the relation between accuracy and speed will degrade a bit. Variable deviations in cross direction can occur. Yet, the required accuracy can still be achieved by limiting the overall speed.

Mode of action / Detection:

SPOT-F can increase the production throughput in the range of 10 fold (theoretically up to 50 fold), depending on the application. This new technology is optimally designed for printing on slides or silicon wafers. Different applications are also feasible.
1) In line spotting with one sample on a single target
2) Spots of the same sample on one target
3) Spots of the same sample on different targets
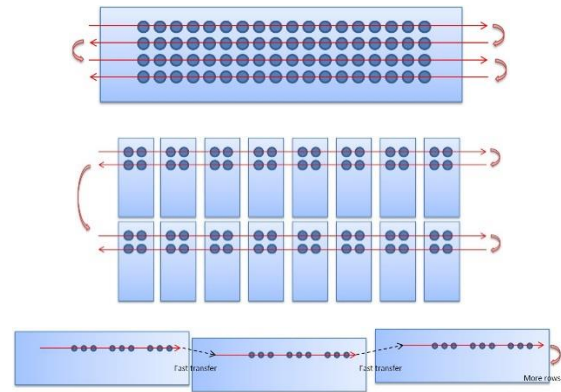4) Spots in line inside different target, but gaps between the spot areas

Figure 2. Scenarios for SPOT-F: (1) Many spots of the same sample on one target. (2) Many targets without Z movements. (3) Several spots in line inside each target, gaps between spot areas.

Product features:

- Accuracy
- Speed
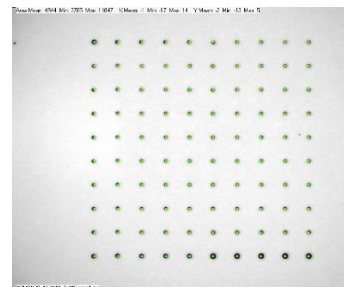- Path length of the flight ca.250 mm
- Quality control

Figure 3. QC image of an array (20 samples, 5 horizontal replicas) spotted in 1-dir, speed 400 mm/s. SD (all arrays) 4.7 µm

Conclusion:

Our SPOT-F technology can reduce array production time up to 10 fold. It enables the triggered spotting for both, array (field) spotting and line spotting with quality control.
SPOT-F is an option that requires software activation (optional module).

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