Technical Note

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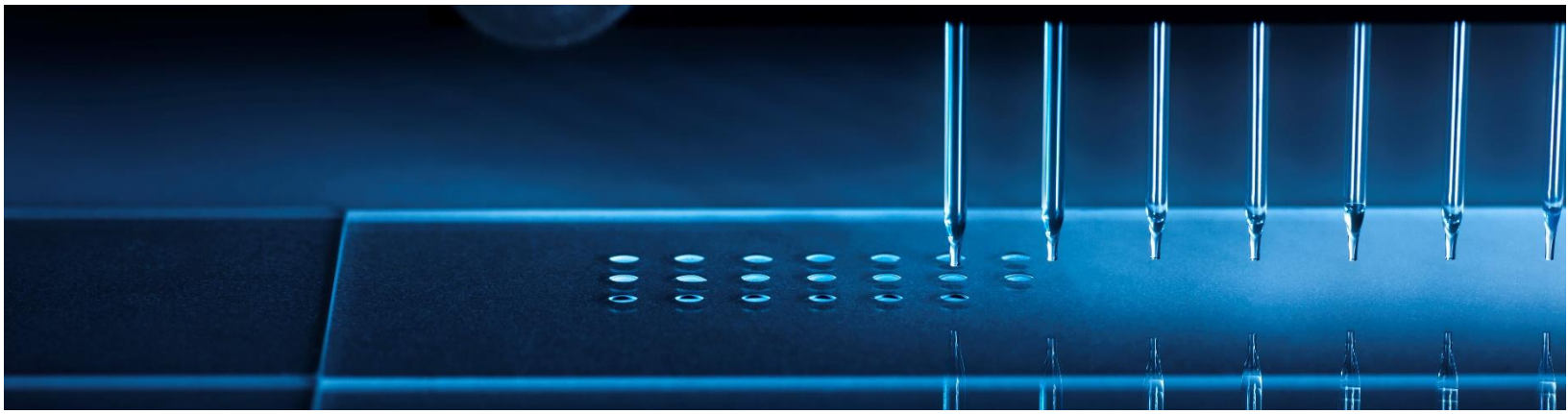

sciFLEXARRAYER LAYER MODE – Spotting Multiple Patterns onto a Partial Selection of Targets in the Same Run

Abstract

SCIENION's sciFLEXARRAYER is a key tool for R&D and manufacturing, enabling automated ultra-low volume dispensing with unparalleled precision. A range of advanced software features are available to provide customization, without the loss of automation, of the dispensing workflow. One such software feature, Layer Mode, allows for the spotting of multiple patterns onto a partial selection of targets within a single run. This enables the combination of multiple spotting runs into a single run, thereby increasing efficiency. In this application note, the usage of Layer Mode and the downstream advantages in terms of time and cost savings are described.

Introduction

Low volume dispensing systems typically permit users to assign a single pattern, per run, to be spotted across all targets. While this functionality results in high throughput, it is also limiting and requires the setup and execution of additional runs for which there are variations in the spotting pattern per target. Implementation of Layer Mode within the sciFLEXARRAYER software grants the ability to design and spot different patterns on a desired selection of targets within a single run. To allow for maximum customization without sacrificing sample or reagent, Layer Mode also enables the ability to assign the aspiration of sample or reagent from a specific well for dispensing to only a partial selection of targets. By implementing the ability to spot different patterns on each target as well as assign the aspiration and dispensing from a specific source well to only a portion of the targets, multiple spotting runs can be combined into a single run, resulting in increased efficiency.

Downstream, this increased efficiency is captured through decreased operator time spent setting up each spotting run, decreased time required to execute all runs, and decreased volume of required sample or reagent, leading to potentially significant cost savings. Importantly, the implementation of Layer Mode maintains the automation and precision dispensing capabilities of the sciFLEXARRAYER, while providing the advantages associated with increased customizability and efficiency.

Methods

The same type and number of probes and targets (e.g., microscope slides) were utilized, and the same run tasks were executed to ensure consistency between all runs with and without Layer Mode. Two different spotting patterns/fields were designed and assigned to a total of 16 fields per target, with four total targets (i.e., two targets per spotting pattern) (**Figure 1**). Overall time required to set up the runs, the total run time length, and the volume of probe used were determined to assess the utility of Layer Mode in comparison to the standard operation of multiple runs required to achieve the same number of spotting patterns.

Combined run with Layer Mode: The Layer Mode software feature was activated, and a new layer was created starting with an empty field. By toggling between layers and targets to view and modify the field for each target, two spotting patterns were assigned to different targets (two targets per spotting pattern). Following target and field set up, the run was executed.

Standard runs without Layer Mode: A single run was performed for each spotting pattern, requiring two total runs. The time in between the end of the first run and the start of the second run, during which time the user set up and initiated the second run, was not included in the total time calculation.

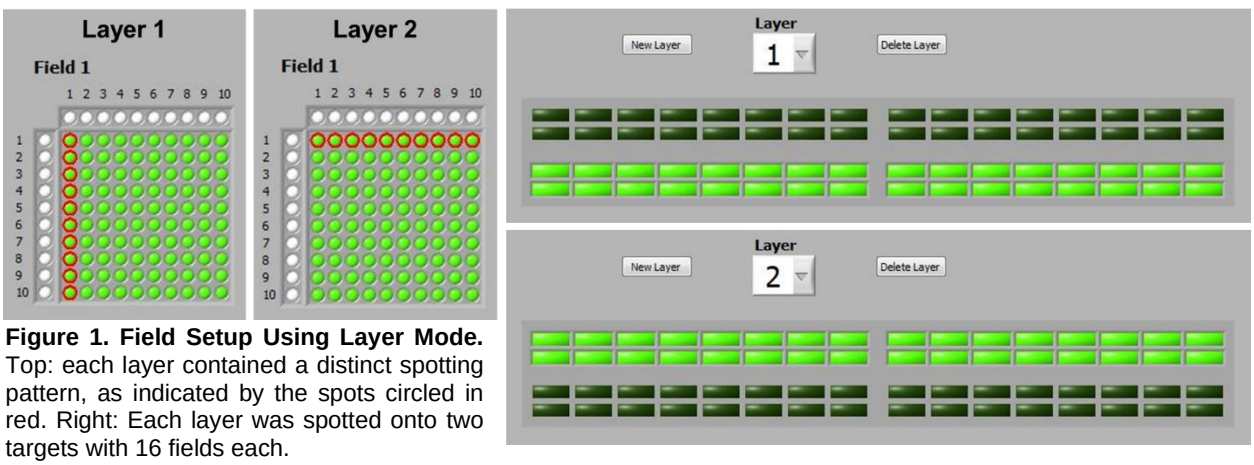

Figure 1. Field Setup Using Layer Mode. Top: each layer contained a distinct spotting pattern, as indicated by the spots circled in red. Right: Each layer was spotted onto two targets with 16 fields each.

Results and Discussion

Layer Mode decreases the amount of time required to set up and execute spotting runs. While the amount of time required to set up runs will vary depending on user familiarity with the software and the complexity of the target and field setup, Layer Mode was still found to decrease the amount of time required to set up, as well as execute, spotting runs. On average, it required approximately 25% less time to set up the run with Layer Mode, as compared to up two separate runs, to accomplish the same spotting patterns on the same number of targets (**Table 1**). Though not included in the calculations, it is important to note that additional time may accumulate during

the time between runs when the user must set up and initiate the execution of the next run, potentially extending the length of time required to complete all runs. The length of time required for execution of the run, not including setup time, was decreased by approximately 59% with Layer Mode, as compared to standard operation with two separate runs (**Table 1**). When multiple runs are performed per day, implementation of Layer Mode has the potential to lead to significant time saving allowing operators to perform more efficiently.

Layer Mode decreases the required volume of the sample or reagent to be dispensed. Using Layer Mode, approximately 50% less sample volume was used, in comparison to the volume used when performing two separate runs (**Table 1**). Without Layer Mode, an increased volume of sample is required due to the mixing zone associated with each aspiration and the increased number of pre-spotting tasks and Autodrop Detections performed over the course of multiple runs. The volume of used sample can be especially important in cases where a very limited volume of sample is available or the reagent to be dispensed is exceedingly costly. Depending on the volume of the sample or reagent to be dispensed and the maximum usable volume of each well in the probe plate, it may also be necessary to either load multiple wells with the same sample or reagent, or re-load the source plate wells during the run. This can lead to an increase in the amount of sample or reagent that is wasted in the dead volume, extension of the length of time required to complete the run and may also inhibit the ability to perform a fully automated run. Implementing Layer Mode may mitigate this by reducing the amount of probe that is wasted through the execution of multiple runs, thereby allowing the total required volume to be contained within a single well.

	With Layer Mode
Amount of Time Setting Up Runs	*25% less time*
Amount of Time Executing Runs	*59% less time*
Volume of Sample Required	*50% less volume*

Table 1. Time and Volume of Probe (Sample or Reagent) Saved by using Layer Mode. Calculations derived from one run with Layer Mode in comparison to two separate runs to accomplish the same spotting pattern on the same number of targets.

Conclusions

Implementation of Layer Mode in a multi-experiment workflow using the SCIENION sciFLEXARRAYER significantly reduces the overall amount of time required to set up and execute runs, as well as the required volume of sample or reagent to be dispensed. Without Layer Mode, separate runs must be performed for each custom dispense pattern, resulting in increased time spent setting up and executing the runs, as well as increased volume of required sample or reagent. Overtime, significant time and cost savings may be achieved through the implementation of Layer Mode.

For more information, please contact us at
USsalessupport@scienion.com or ticket@scienion.com

Contact Us

SCIENION GmbH
Wagner-Régeny-Straße 15
D-12489 Berlin
Germany
Tel: +49 (0)30 6392 1700
support@scienion.com
www.scienion.com

SCIENION US, Inc
4405 E. Baseline Road Suite
#123
Phoenix, AZ. 85042
United States
Tel: +1 (888) 988-3842
USsalessupport@scienion.com

SCIENION (UK) Ltd
2000, Lakeside North Harbour
Western Road, Portsmouth
PO6 3EN
United Kingdom
+44 (0)7483 388 271
+44 (0)23 9323 3603
support@scienion.com