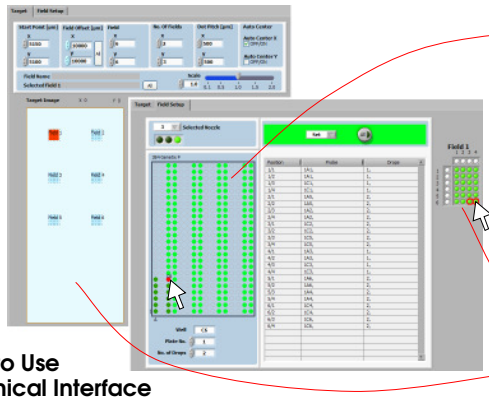
# Software Development for Diagnostics Manufacturing

Dr. Miguel Rodríguez, Martin Horn

**Scienion AG, Volmerstr. 7b, 12489 Berlin, Germany**

## Introduction

The production of modern and state-of-the-art diagnostic test formats represents a challenge for software development. Moving from single parameter tests (e.g. pregnancy testing) to multiparameter test formats in applications like allergy testing, cancer diagnostics and other complex diseases, requirements for accompanying software solutions are exponentially increasing. This applies not only to the process control itself, but ever more to the user interface, which has to be intuitive and easy to use, as well as to the quality control, which has to accompany the whole production process.

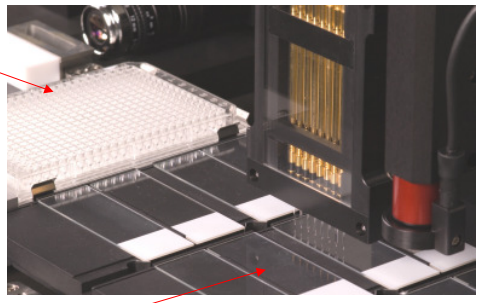


**Easy to Use Graphical Interface**

- Intuitionally build your probe-to-array pattern or load a previously saved set-up

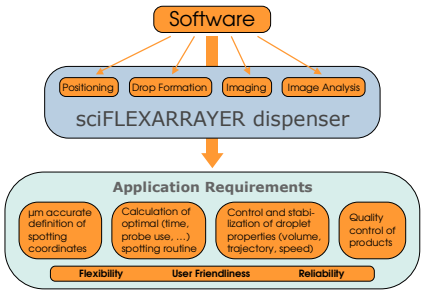
The set-up is automatically adapted to the number of mounted nozzles

- Run your microarray print job



sciFLEXARRAYER S11
8 Channels

## Software Requirements for Picoliter Dispensing

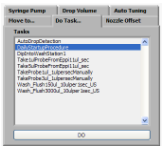



## Flexible Level of Automated Handling

Besides the design of the spotting set-up, most of the operator's interaction with the software is the preparation of the liquid handling and dispensing units.

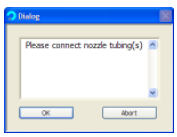
The level of automation and guidance can be adapted to the specific **operator's knowledge and authorization**. Nearly any action (except for physical intervention) can be put into a **macro task** (lists of sub-tasks) for automatic execution. A detailed login and access level management is available.

- **Example:**



Use of predefined macro tasks.

→ (e.g.)




+ ...

The macro task shows messages where physical intervention is required.

OR

... 

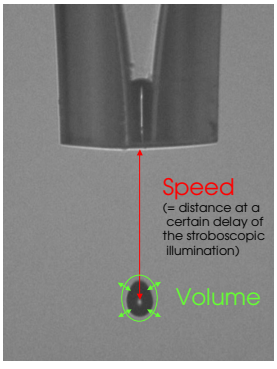
+ (e.g.) 

+ ...

The dispensing system can be set up by an expert operator using the basic software control tools.

## Automatic Control and Tuning of Droplet Properties (Volume, Trajectory, Speed)

1. The control of the droplet's trajectory and speed is of major importance to ensure the printing quality.
2. The droplet's volume can be tuned, allowing the operator to choose the precise amount of liquid to be dispensed, even in a multi-channel operation.
3. The tuning of the droplet's speed and/or volume can stabilize the printing and, hence, provide enduring quality in production.

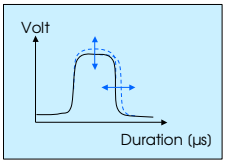



The software tool to calculate the volume of a droplet from its image has been developed in cooperation with celisca
CENTER FOR LIFE SCIENCE AUTOMATION

- **Tuning**

The software can tune the volume and speed by regulating the amplitude and duration of the **piezoelectrical pulse** (see image below) which produces the **drop ejection**.

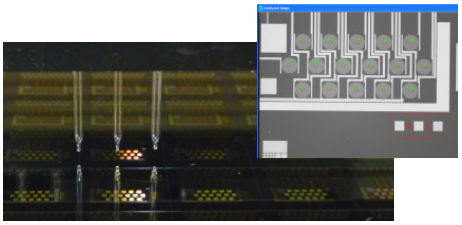
By using different **algorithms**, either one parameter, droplet volume or speed, can be tuned and stabilized, or **both parameters simultaneously**. By keeping the speed constant, the volume tuning is more stable, i.e. the pulse parameters are kept within reasonable ranges.




## Camera Based Automatic Target Analysis

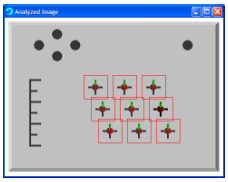
***Main application*:**

**Fast and highly precise loading of biosensors**

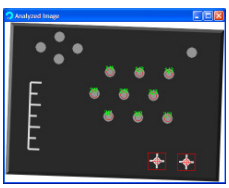


A variety of biological substances have been dispensed onto different biosensors using a sciFLEXARRAYER with special hard- and software features offering distinct advantages for highly accurate loading of biosensors:

- sciDROPVOLUME **software module** for precise measurement of **droplet volumes**
- Microscope with CCD camera for detection of structures in combination with a **software modules** for **detection and analysis of microstructures**



All structures that match the template image (red box) are recognized. The corresponding positions to dispense on are marked (red cross) and ordered (green numbers).



Rotation is corrected.

The recognition of the template image as fiducial marks not only defines the coordinate reference, but also allows for an angular correction. Positions to dispense on (red circles) can be defined freely and without the need of unique structures at their locations.

- **Quality Control**