



FL-QC: Extending Quality Control capabilities using FLuorescence

Abstract

Background: SCIENION's sciFLEXARRAYERs dispense precise volumes of liquids in the pico- to microliter range onto virtually any target. A Quality Control (QC) module in the sciFLEX software automatically evaluates print results according to defined parameters, such as spot presence, position accuracy, size, and shape.

Challenge: Dependent on the optical properties of the target and the dispensed liquids, printed spots may not be detectable with conventional options of the QC module. For example, if the reagents are dispensed into a narrow cavity, evaporate rapidly without leaving a stain, or the target is porous and absorbs the material (such as nitrocellulose membranes).

Solution: The sciFLEXARRAYER camera can be upgraded with a FL-QC set for print quality control based on fluorescent imaging. This setup has been successfully applied to dispense liquids on PCR cartridges for Point-of-Care devices and can be adapted to other applications and fluorescent dyes.

Case Study

Materials and methods used in this case study are summarized in Table 1. After dispensing of the labeled oligonucleotide mixes into a batch of 96 microfluidic cartridges, print QC was performed using the sciFLEXARRAYER's head camera with standard white ring light or upgraded

with the FL-QC set, respectively. The dispensed reagents contained the fluorophores FAM and TAMRA for Fluorescence Resonance Energy Transfer (FRET). The light emitted by TAMRA could be used for detection, while the excitation light was cut off by a filter glass.

Table 1: Materials and Methods used in this case study.

Instrument type	sciFLEXARRAYER SX with sciDROP PICO print head
Reagents to dispense	Oligonucleotide mixes, including hydrolysis probes modified with fluorescent labels
Fluorophores	FAM and TAMRA
Target Substrate	Microfluidic cartridges for Point-of-Care PCR applications
Dispense volume	20 nL
Cavity diameter / depth	1 mm / 2 mm

Results

It can be seen in Figure 2 that when using a white coaxial light source (left panel), no spots are visible; however, after upgrading the camera with an FL-QC set, all printed spots can be readily detected with high contrast (right panel).

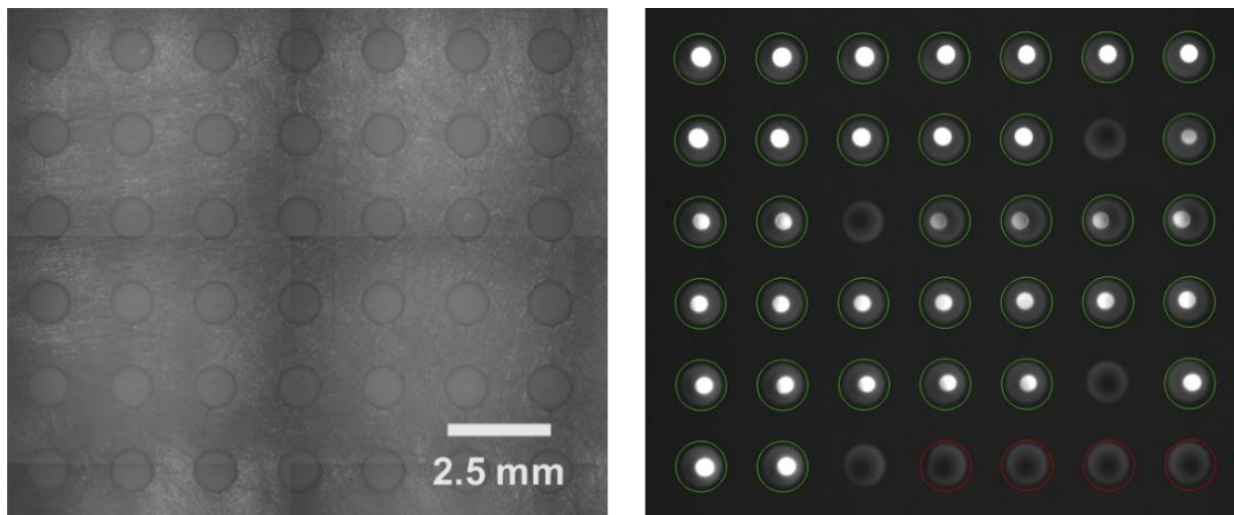


Figure 1 Photos taken with sciFLEXARRAYER head camera, showing cavities of a microfluidic cartridge, printed with fluorescent oligonucleotides. Left: with white coaxial light, no filters; right: same target and same camera but upgraded with FL-QC set and QC rating.

Conclusion and future directions

The sciFLEXARRAYER's head camera can be upgraded with a FL-QC set to perform automated print QC based on fluorescence. The printed solution may already contain a fluorescent dye, or a suitable dye can be added. This can help to visualize spots when the target's optical properties prevent its detection with standard lighting options. The FL-QC set can be adapted to a range of common dyes and customized solutions are available upon request.

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