

Technological advancement: ensuring reliable data in protein arrays

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Introduction

Producing capture proteins for microarrays is a lengthy and challenging process¹ and missing values during data analysis may lead to undesirable biases skewing the outcome of research projects. The importance of eliminating missing spots in microarray production is crucial².

With increased high-density printing demands for diagnostics and biomarker discovery applications, accurate QC of microarrays is more important than ever³. As part of its in-line QC imaging system, Arrayjet have developed an artificial intelligence software upgrade that not only recognises missing samples in real-time but also reprints them automatically.

Materials and Methods

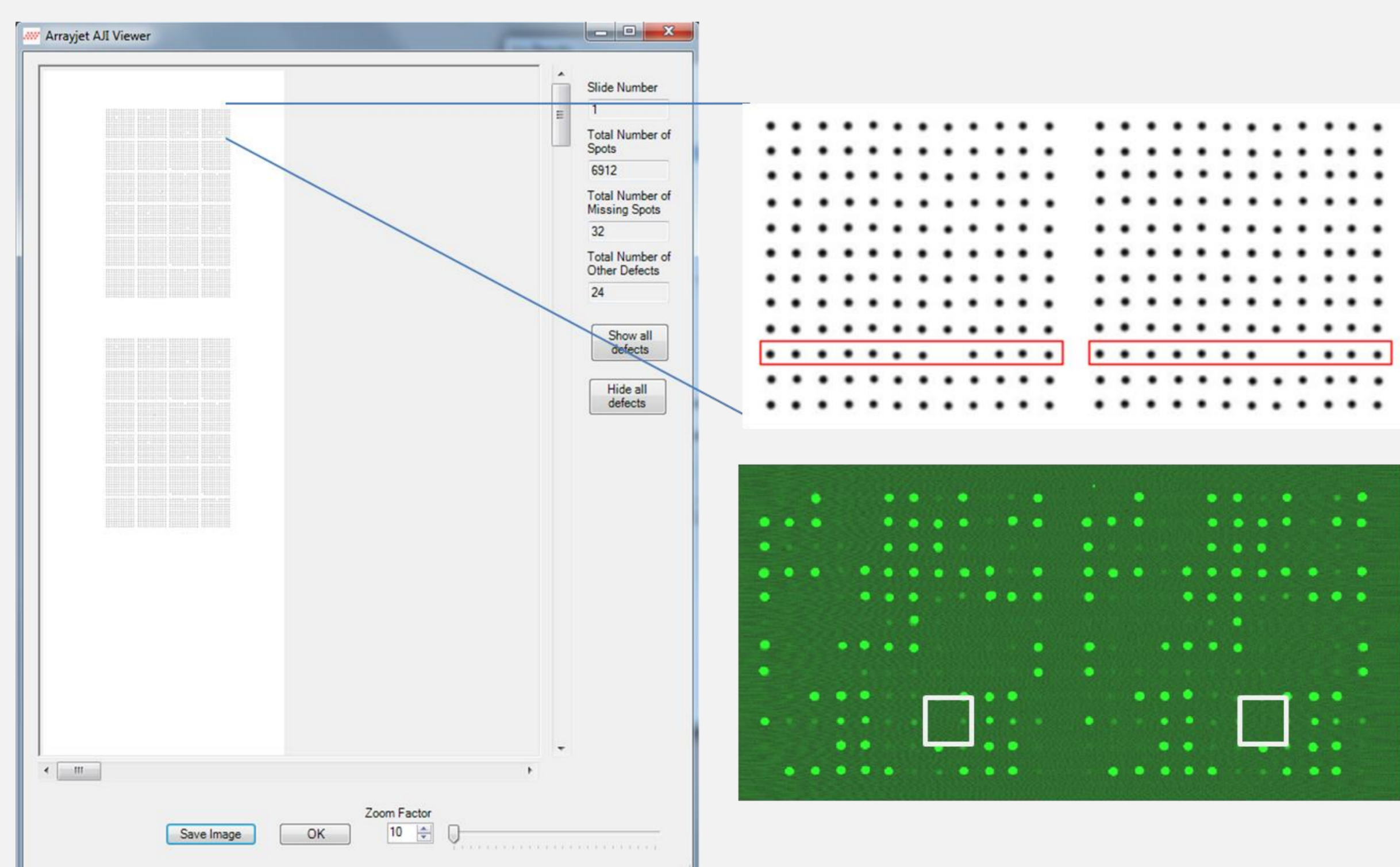
Arrayjet instruments are widely used for high-density array printing.^{4,5} For the purpose of these tests, printing was completed on an Arrayjet Marathon Argus™. Subsequently, slides were scanned on an Axon Genepix 4000B microarray scanner.



Iris™ in-line QC

The Iris™ optical QC system consists of twin cameras that capture images of the samples immediately after printing. Images are processed in real time and the print quality of each individual slide is evaluated. Missing samples and other defects are identified by the software and reported upon completion of the print run.

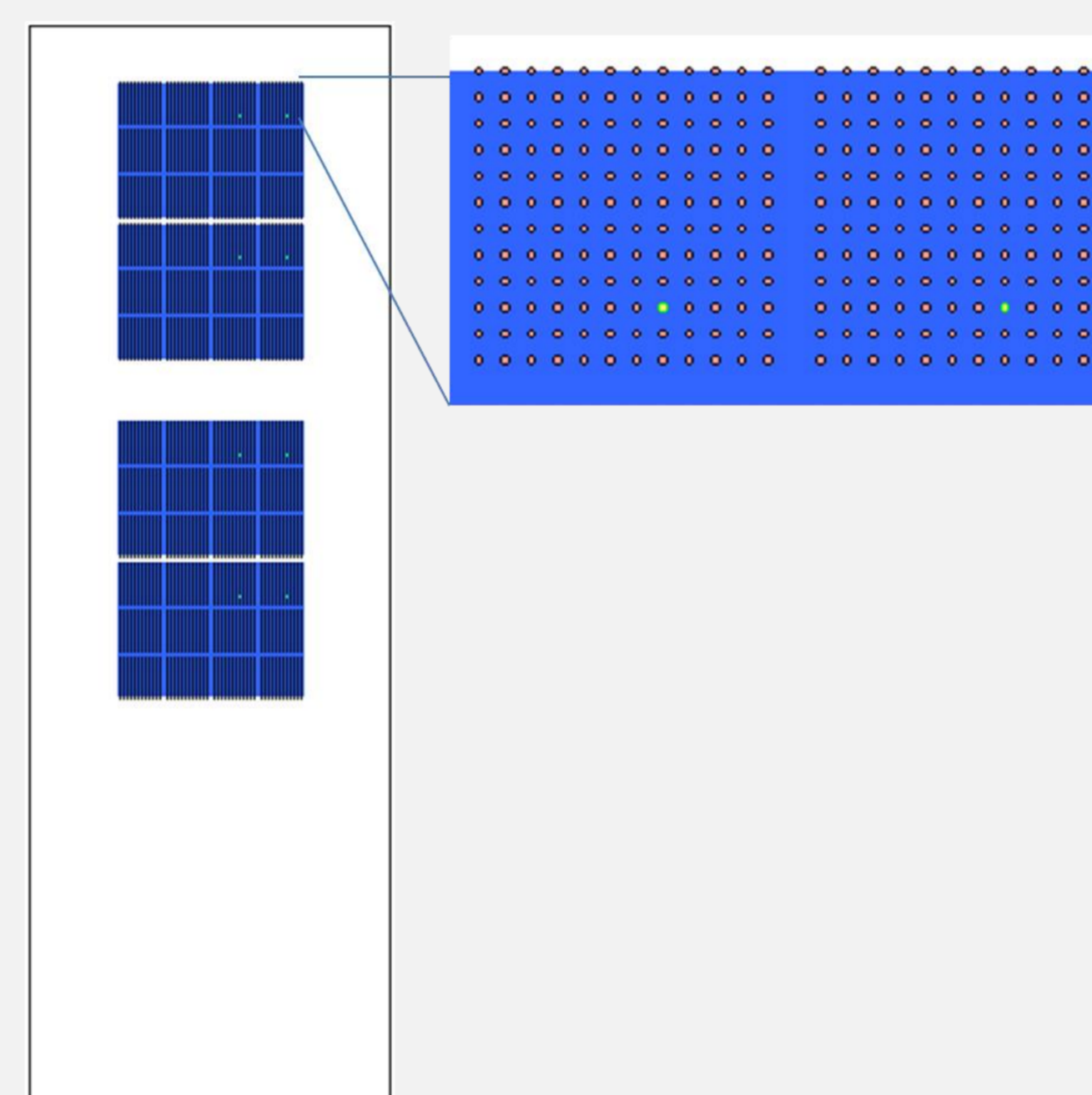
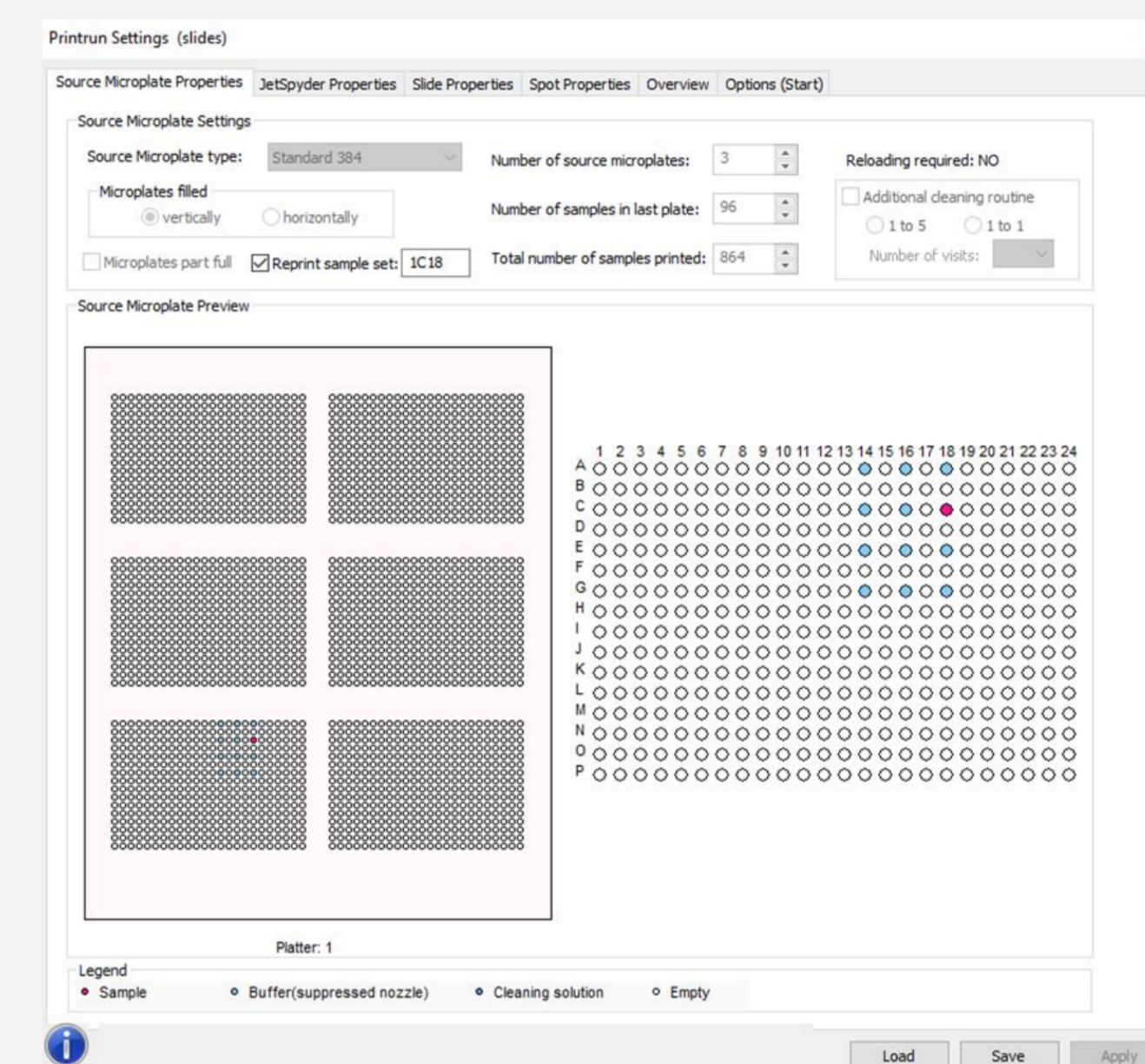
Real-time imaging capabilities make the Iris™ camera a consistent and reliable tool for the detection of missing features where differentiating between a non-reactive protein and a missing feature might otherwise be difficult.



Iris™ spot refill

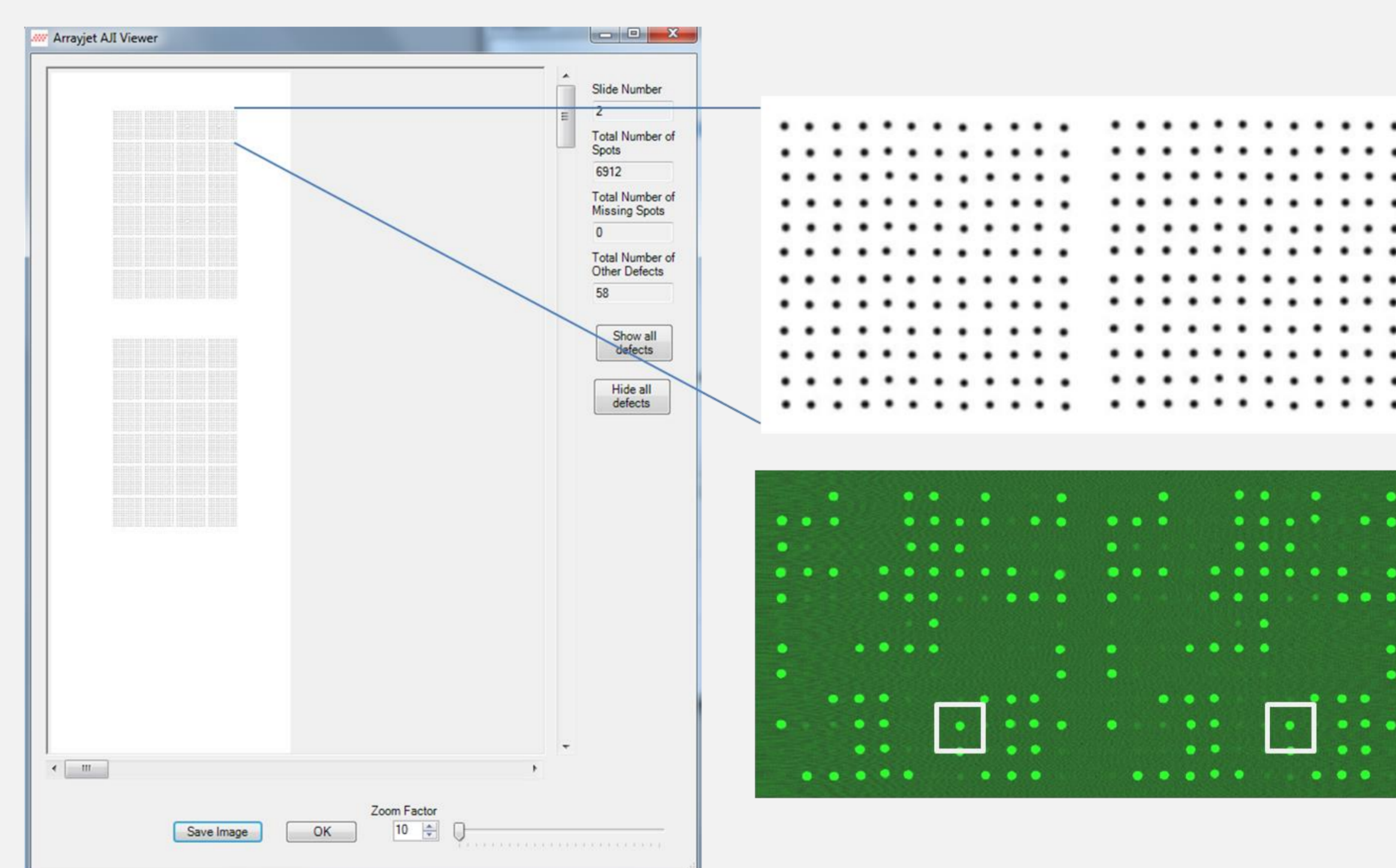
In the unlikely event that missing spots are detected during a print run, if the software estimates a high probability of successful reprinting, the instrument will attempt to do so automatically with the sample still in the print head. Further missing spots are prevented by real-time disablement of faulty nozzles. Upon completion of the print run, if the cause is found to be a problematic sample or an empty well, the user can replace the sample before starting a spot-refill print run.

1. The Arrayjet Command Centre will highlight in a preview which well contains the problematic sample.



2. After reprinting, the refilled spot will be highlighted in green on the overview tab.

New images will then be generated by the software to show the presence of the spot. Comparison with the original image shows that the sample has been printed: a scan of the slide provides confirmation.



Conclusion

Arrayjet have successfully developed an optical QC system which generates consistent real-time data for individual slides. With customisable criteria to meet user-specific requirements, the Iris™ will detect and identify missing or merged spots, artefacts, the presence of satellites or misalignment. Furthermore, it can reprint missing spots both during and after the print run. Consequently, the Iris™ is a novel quality control system that ensures reliable microarray production.

References:

1. Sydor and Nock, *Proteome Science*, **2003**, 1:3
2. True and Feng, *Molecular Diagnostics*, **2005**, 204
3. *Protein Microarrays*, **2005**, 434

4. Salmeán, et al. *Nature Scientific Reports*, **2017**, 7, 2880
5. Vickovic, et al. *Nature Communications* **2017**