96-Well Microplate printing using Arrayjet Inkjet Bio-Printing Technology

Printing Versatile High-Resolution Microarrays onto Shallow 96-Well Plates and 96-Well Two-Part Microplates Using Arrayjet Microarrayers

Introduction

Shallow well plates and two-part plates (flat glass or similar material of same dimensions than a microplate) can be printed using Arrayjet instruments by replacing the slide trays by microplate trays. It has been observed that excellent printing will be achieved by printing onto microplates, and that the only testing required is to ensure good spot spacing and accurate morphology in the 96 areas of the microplate.

Experimental Design

The test indicates spot printing onto 96-well microplates. This procedure only covers for testing the printing capabilities onto Proxiplates (shallow well) and two part-plates type substrates. The fluorescence levels or any other indication for consistency is not covered.

Substrates

The following substrates could be considered:

1. Shallow well plates (Proxiplates)

Proxiplates are standard flat bottom 96-well microplates, specifically the Perkin Elmer ProxiPlate-96 or other plates of the dimensions shown in Figure 1. The shallow plates have a height of approximately 1.4 cm and a special tray needs to be built to accommodate that height.

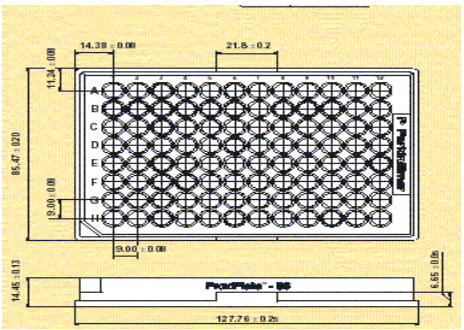

Fig. 1 ProxiPlate-96 (Perkin Elmer, Product No 6006270)

The design intention for the well-plate tray holder was that it should be interchangeable with the standard slide trays manufactured by Arrayjet, allowing the end user to quickly alternate between substrate types. The tray can accommodate 4 x 96-well plates (Figure 2). The plates should be easily fitted to the tray, with a mechanism for positively locating the trays against the reference edges of the tray holder. The system should retain the ability to perform a test slide when the well plate tray holder is in use.

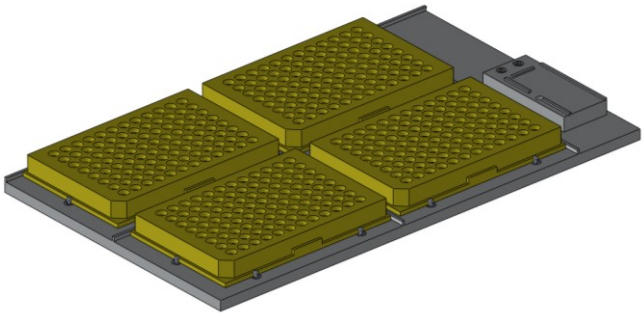

Fig. 2 ProxiPlate-96 tray holders, designed by Arrayjet

The depth of each well is 3.14mm. The clearance from the nozzle plate to the top of the well should be 0.8mm. This makes the throw distance around 4mm. Labelled DNA was printed using Arrayjet's Jetastar™ Nucleic Acid Printing buffer as shown in Figure 3.

Fig. 3 ProxiPlate-96 well spot printing.

2. Two part-plates

The probes were printed onto a flat surface of the same dimensions as a 96 micro titer plate in a layout of 96 identical subarrays. An upper structure was then fixed to the glass surface to multiplex profiling of 96 different samples (Figure 4). Schott Nexterion® MPX-96-well two-part microplate was used for this study (Arrayjet product code: AJC048).

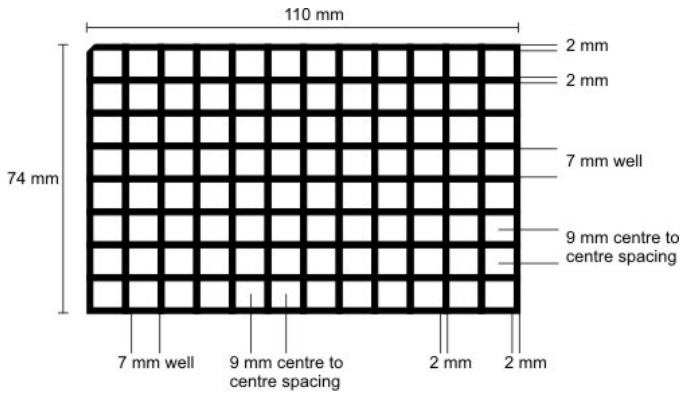

Fig. 4 Two part-plate overview.

Arrayjet software allows for a printable area of 6mm x 6mm on microplate printing mode, as shown in Figure 5.

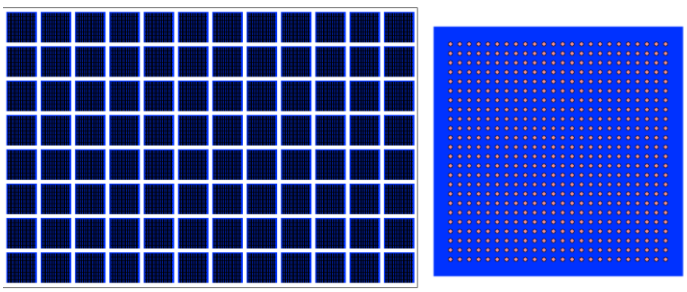

Fig. 5 Target microplate properties tab in Marathon Command Centre

If 300 µm spacing is set horizontally and vertically, and with a safe margin of 400 µm, an array of 24 can be printed,
i.e. a total of 576 features per subarray (Figure 5).

Surface chemistries

If a specific surface chemistry is preferred, availability of coated substrates in the above-mentioned substrate options should be considered. Arrayjet can print onto any required surface chemistry; non-coated plastic is also an option.

Conclusion

Arayjet systems are fast and efficient for 96-well microplate printing. Printing a 24x24 array format into 20 such 96-well two-part plates would take approximately 12 hours. Arrayjet software and hardware can be modified to accommodate any 96 well microplate format and printing layout. Printing onto this type of plate has many advantages:

- High density arrays
- Efficient inkjet printing using Arrayjet technology
- Multiplex assays
- Efficient use of space
- Reproducibility tests
- High sample throughput
- Cost savings
- Compatibility with automated handling systems

To learn more about two-part plate printing and shallow well printing, contact Arrayjet scientists.