Electronic Supplementary Material (ESI) for Lab on a Chip.

A Modular Microarray Imaging System for Highly Specific COVID-19 Antibody Testing

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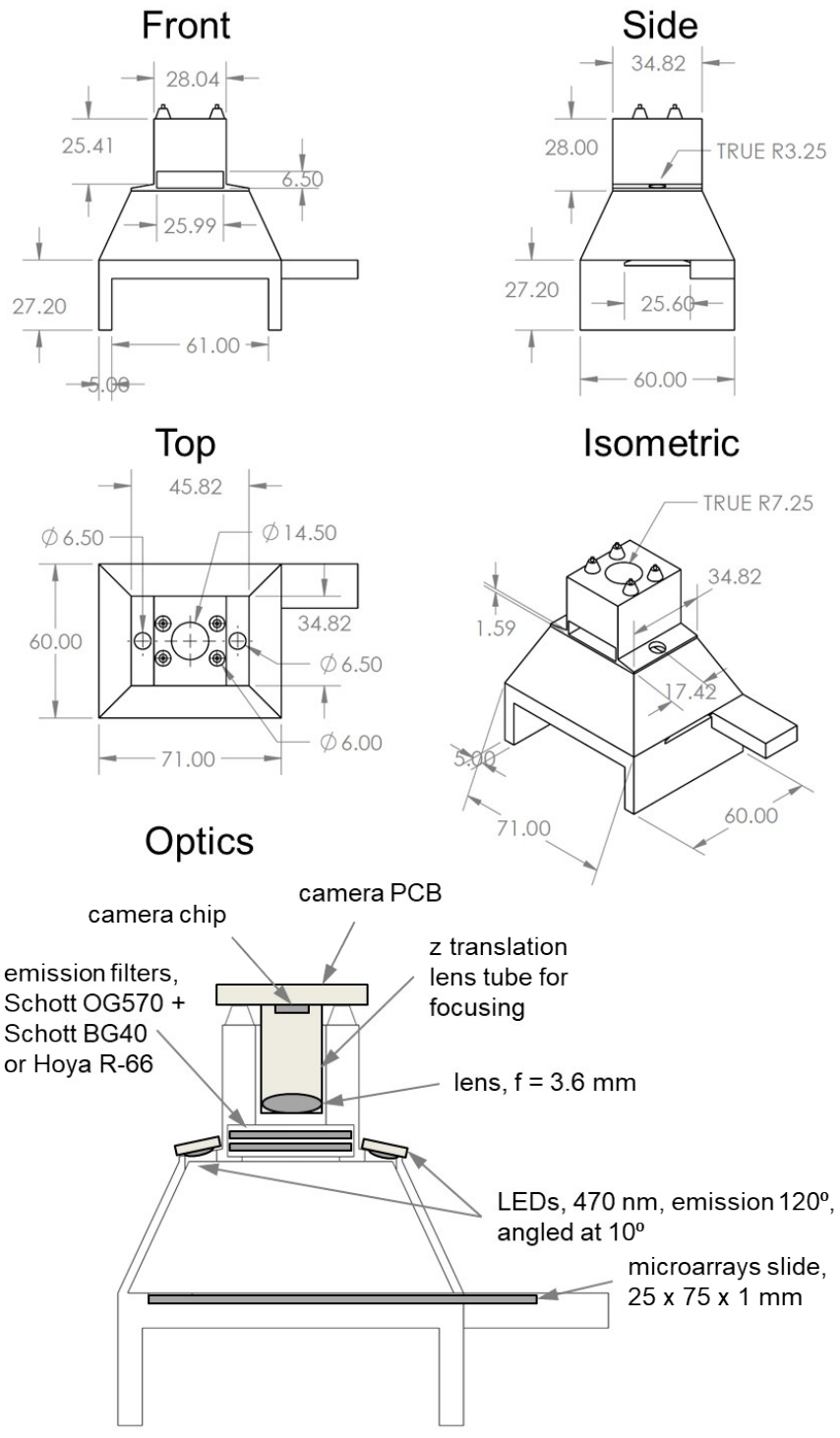
Supporting Information

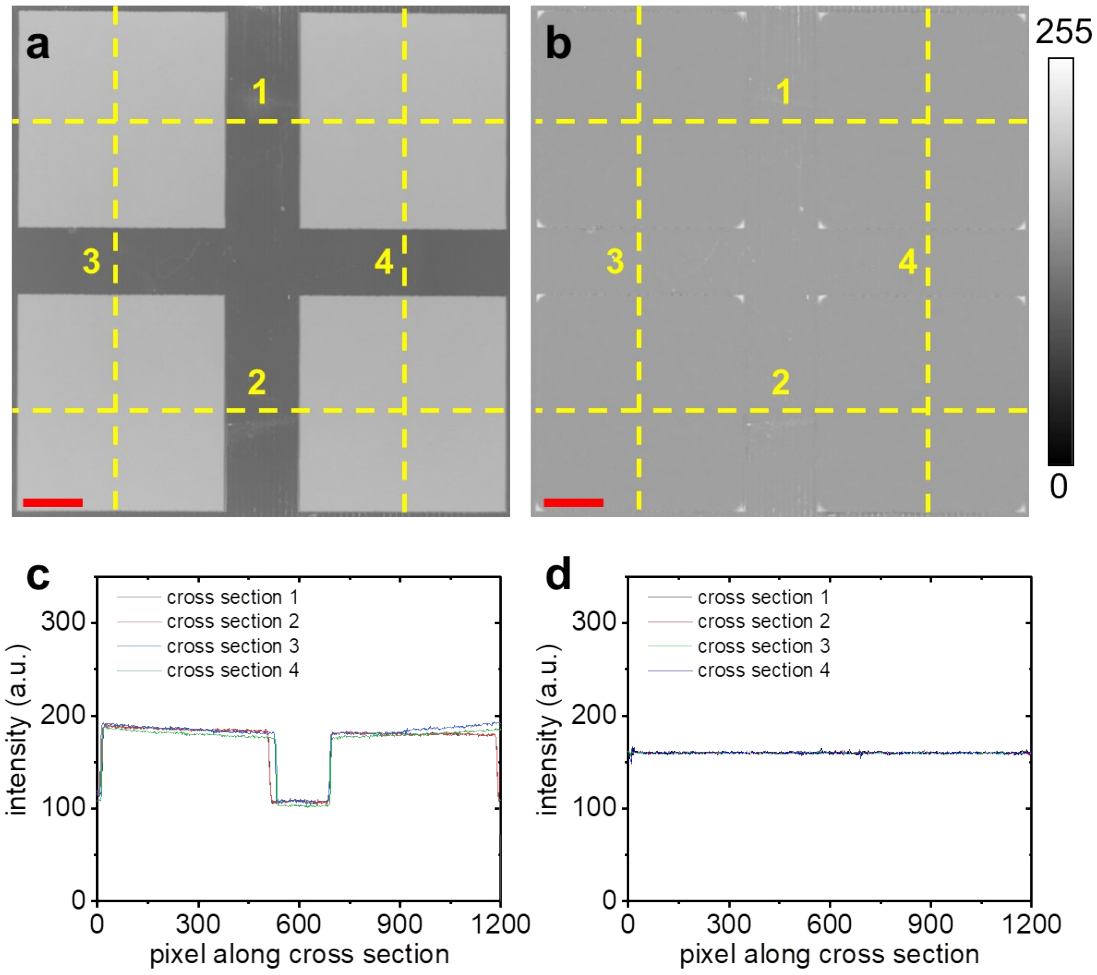
Supplementary Fig. S1	Detailed schematic of the TinyArray imager.
Supplementary Fig. S2	Illumination homogeneity.
Supplementary Fig. S3	Variations between imaging replicates.

Supplementary Fig. S1.



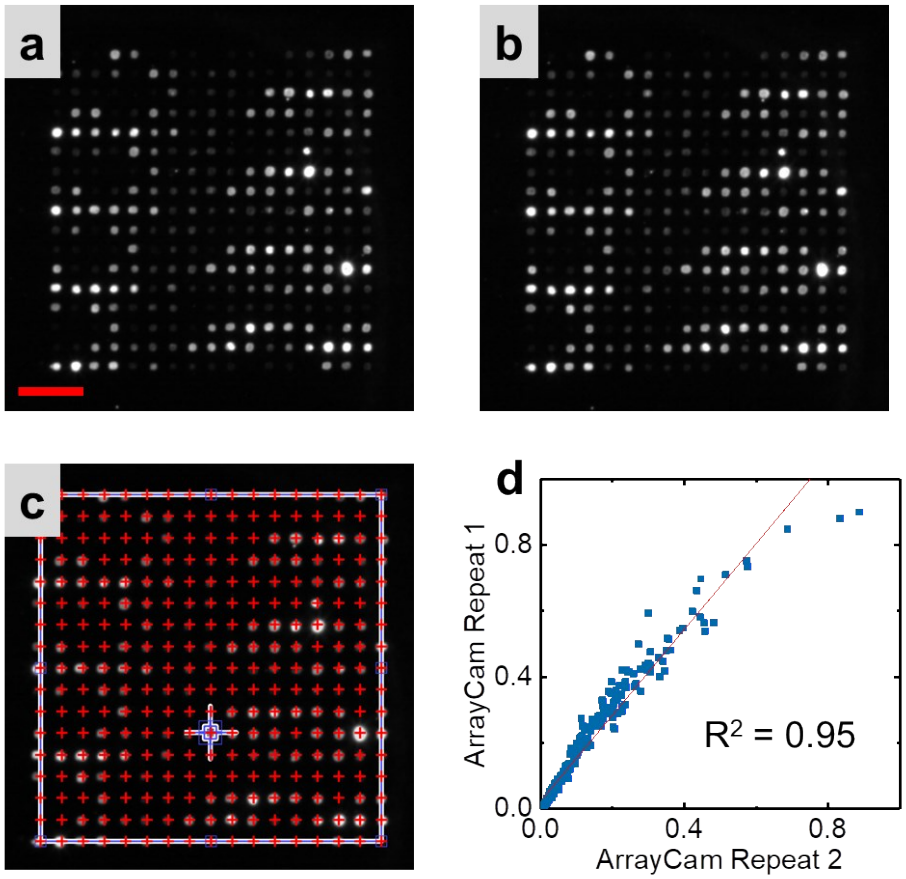
Detailed schematic of the TinyArray imager. Front, side, top, and isometric views of the TinyArray imager with dimensions given in millimeters as well as locations of optics, camera, and LEDs within the device.

Supplementary Fig. S2.



Illumination homogeneity. To evaluate the homogeneity of illumination of our TinyArray imager, we acquired images of a blank microarray slide without emission filters. (**a**) Image of an exemplary region of 2 x 2 microarray nitrocellulose pads on a glass substrate. To subtract background and to compensate for slight inhomogeneities, we applied a 15 pixel radius median filter to the raw image acting as a low pass filter. As we only want to detect the high spatial frequencies of the smaller microarray dots (~5 pixels radius), we can eliminate low frequency background by subtracting the median filtered image from the original raw image. The resulting filtered image is shown in panel (**b**). For visualization, a constant offset (the average image intensity) was added back to each pixel. (**c,d**) The intensity was plotted along the cross sections marked by dashed lines in panels (a,b). (**c**) Depending on the cross section, minimal inhomogeneities in the illumination along the pads can be detected (<5% deviation within one pad). (**d**) After removal of low frequency background, no more inhomogeneities can be detected. Scale bars, 2 mm.

Supplementary Fig. S3.



Variations between imaging replicates. To evaluate the minimum deviation between the commercial ArrayCam and our TinyArray imager, we repeated imaging of the same microarray slides with the ArrayCam, two repeats of images of the same pad are shown in (**a,b**). For quantification, we manually selected the first row of microarray dots. From this input, the current algorithm extrapolates the positions of all dots based on the number of rows, number of columns, distances between dots, and sizes of the microarray dots that are known and can be entered as parameters. (**c**) Dot positions found by the algorithm after user selection of the first row of microarray dots. (**d**) The intensities in all microarray dots were quantified in both images and graphed against each other, the resulting R^2 was 0.95. As these data were recorded with the same commercial imager (ArrayCam, Grace Bio) of the same microarray slide, this is the minimum deviation we can expect when comparing to data from images acquired with our TinyArray imager. Scale bar, 1 mm.