

## Accepted Manuscript

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PII: S0021-9673(14)00724-9  
DOI: <http://dx.doi.org/doi:10.1016/j.chroma.2014.05.005>  
Reference: CHROMA 355396

To appear in: *Journal of Chromatography A*

Received date: 3-2-2014  
Revised date: 25-4-2014  
Accepted date: 1-5-2014

Please cite this article as: Gordon H. Hall, David Sloan, Tianchi Ma, Madeline H. Couse, Stephane Martel, Duncan G. Elliott, D. Moira Glerum, Christopher J. Backhouse, An optical relay approach to very low cost hybrid polymer-CMOS electrophoresis instrumentation, *Journal of Chromatography A* (2014), <http://dx.doi.org/10.1016/j.chroma.2014.05.005>

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## An optical relay approach to very low cost hybrid polymer-CMOS electrophoresis instrumentation

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### Abstract.

1        **Abstract.**  
2        Electrophoresis is an integral part of many molecular diagnostics proto-  
3        cols and an inexpensive implementation would greatly facilitate point-of-  
4        care (POC) applications. However, the high instrumentation cost presents  
5        a substantial barrier, much of it associated with fluorescence detection.  
6        The cost of such systems could be substantially reduced by placing the  
7        fluidic channel and photodiode directly above the detector in order to  
8        collect a larger portion of the fluorescent light. In future, this could be  
9        achieved through the integration and monolithic fabrication of photoresist  
10       microchannels on complementary metal-oxide semiconductor microelec-  
11       tronics (CMOS). However, the development of such a device is expen-  
12       sive due to high non-recurring engineering costs. To facilitate that de-  
13       velopment, we present a system that utilises an optical relay to integrate  
14       low-cost polymeric microfluidics with a CMOS chip that provides a pho-  
15       todiode, analog-digital conversion and a standard serial communication  
16       interface. This system embodies an intermediate level of microelectronic  
17       integration, and significantly decreases development costs. With a limit of  
18       detection of  $1.3 \pm 0.4$  nM of fluorescently end-labeled deoxyribonucleic

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