A microfluidic flow cytometer concept based on spatially modulated emission — Christian Sommer¹, Tobias Broger¹, Peter Spang¹, Stephan Quint¹, Thomas Walther², and Michael Bassler¹ — ¹Institut für Mikrotechnik Mainz, Carl-Zeiss-Straße 18-20, 55129 Mainz, Germany — ²TU Darmstadt, Institut für angewandte Physik, Schloßgartenstraße 7, 64289 Darmstadt, Germany

Flow cytometers are indispensable tools in medical diagnosis routines. In conventional flow cytometry fluorescently tagged biological cells in suspension are passed through a narrow laser focus and a fluorescent pulse is detected for each cell. The fluorescent intensity is recorded on a single cell level enabling the sizing of cell populations differentiated by various, cell specific fluorescent markers. The microfluidic flow cytometer concept based on spatially modulated emission uses a widened detection zone, which is superimposed with a pseudo-random pattern leading to a temporally extended, distinctly coded signal recorded for each fluorescent cell. Each cell is reconstructed from the coded signal by correlation techniques. An improved signal to noise ratio and cell discrimination capability is achieved in respect to conventional flow cytometry. Both, fluorescent intensity and particle velocity are determined simultaneously for each individual cell. In the microfluidic channel, the cell is subjected to a flow profile. According to the Segré-Silberberg effect cells align in the flow profile at distinct distance to the channel wall. This effect is investigated in detail and its benefit for flow cytometry is presented.