# Modulation-frequency encoded multi-color fluorescent DNA analysis in an optofluidic chip

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We introduce a principle of parallel optical processing to an optofluidic lab-on-a-chip. During electrophoretic separation, the ultra-low limit of detection achieved with our set-up allows us to record fluorescence from covalently end-labeled DNA molecules. Different sets of exclusively color-labeled DNA fragments—otherwise rendered indistinguishable by spatio-temporal coincidence—are traced back to their origin by modulation-frequency-encoded multi-wavelength laser excitation, fluorescence detection with a single ultrasensitive, albeit color-blind photomultiplier, and Fourier analysis decoding. As a proof of principle, fragments obtained by multiplex ligation-dependent probe amplification from independent human genomic segments, associated with genetic predispositions to breast cancer and anemia, are simultaneously analyzed.