



## MICROFLUIDIC DIAGNOSTIC SYSTEMS FOR CLINICAL MULTIPLEX ANALYSIS

### Task

Cells and biomolecules circulating in the blood are carriers of diagnostic information, the analysis of which is a key to highly effective, individualized therapeutic concepts. By acquiring various molecular diagnostic and microbiological parameters simultaneously, physicians can generate an accurate clinical picture and, thus, develop an individually adapted therapy for the patient. In order to establish such multiplex diagnostics in everyday clinical practice, they need diagnostic assays and automated readout systems that measure as many parameters as possible at low cost with a small sample volume.

### Method

Scientists at Fraunhofer ILT have developed a screening system that can analyze a large number of different diagnostic particles in one sample. Each particle type presents its own species of capture molecules on its surface, which specifically bind an analyte to be detected. The particle is identified through its characteristic fluorescence and scattering properties; the bound analyte molecules are detected and quantified through a fluorescent secondary marker. By acquiring and differentiating the different particle species and the analyte molecules bound to them, this system can detect many

different diagnostic parameters simultaneously in a single measuring step. The screening systems use laser beam sources specifically adapted to the measurement task, are compact and provide real-time data processing.

### Results

Based on a microfluidic system, a functional model for an in-vitro diagnostic device has been developed, which automatically measures particle samples and their bound analytes with an integrated fluorescence and scattered light sensor system. This in-vitro diagnostic device currently allows up to 24 different disease markers to be detected. A real-time-capable electronic platform developed for this purpose controls the measuring system and evaluates the measured data, enabling integration into automation solutions such as fully automated diagnostics laboratories.

### Applications

Fields of application are infection and autoimmune diagnostics, microbiological rapid tests and preventive medicine.

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1 *In-vitro diagnostic device  
or clinical multiplex analysis.*

2 *Micro flow cell of highly integrated  
measuring optics.*