



# On-Chip Polymerase Chain Reaction with integrated Real-Time Detection

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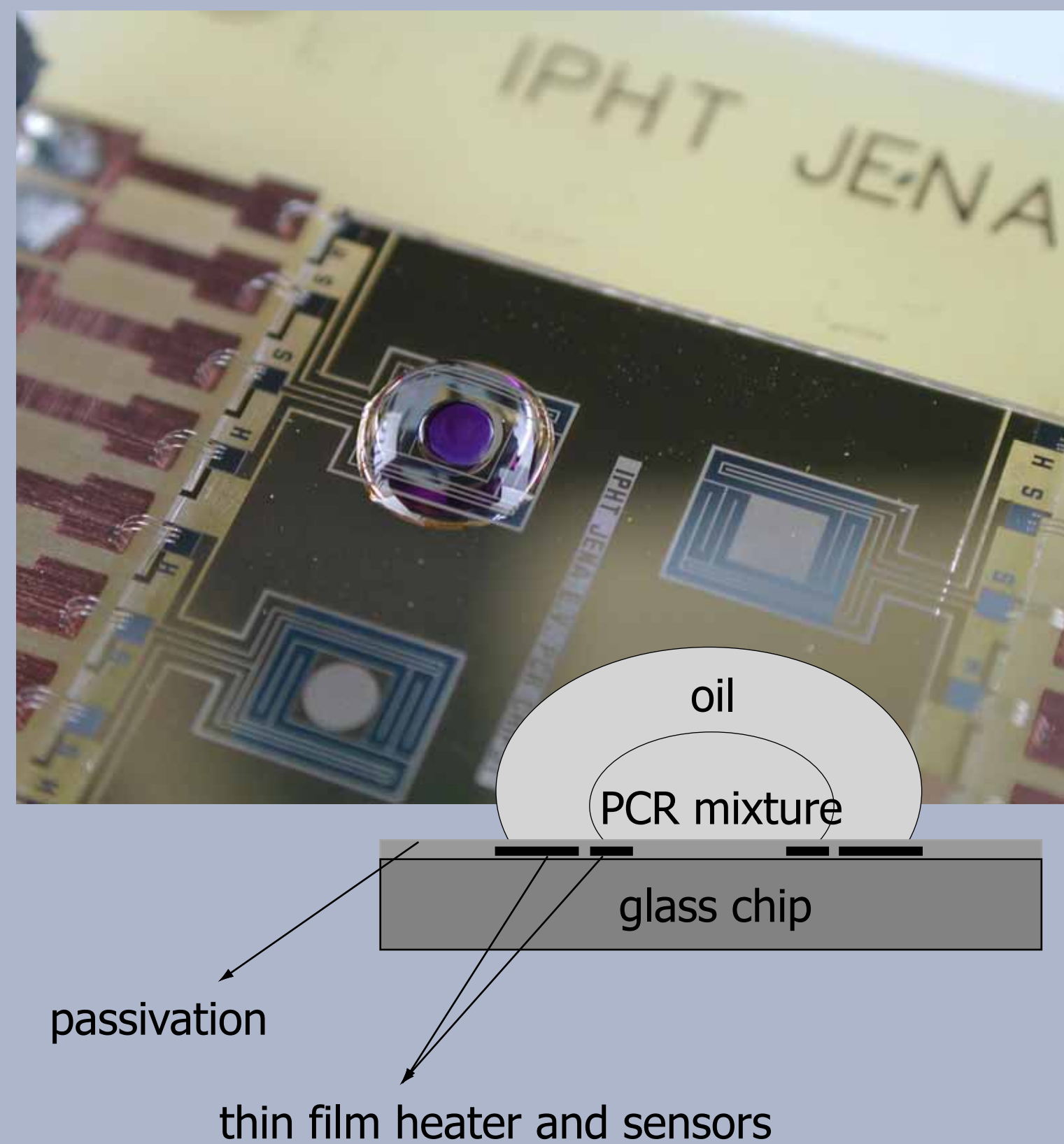
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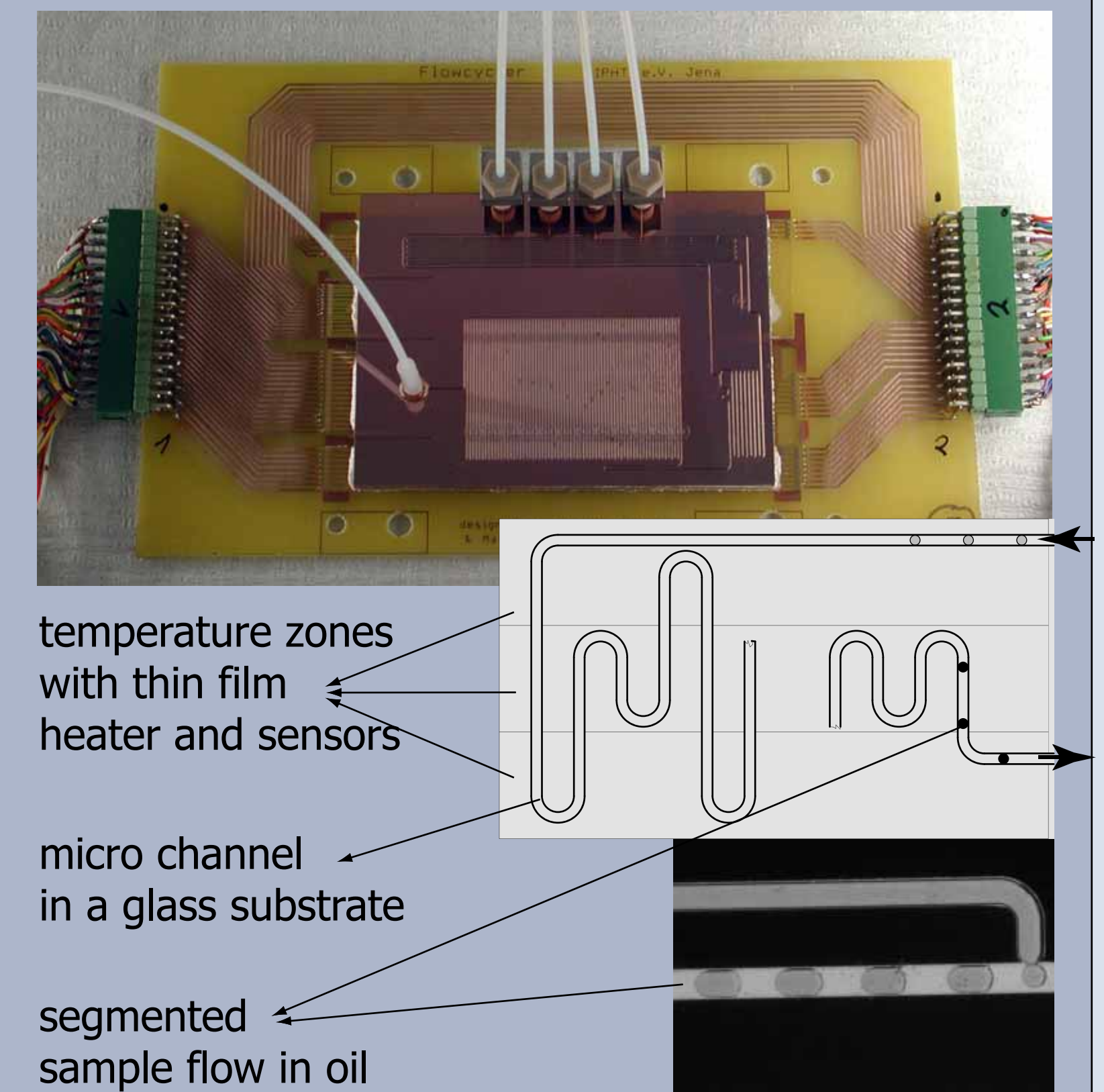
## Micro Chip Thermocyclers for PCR

stationary 2D-PCR-Chip

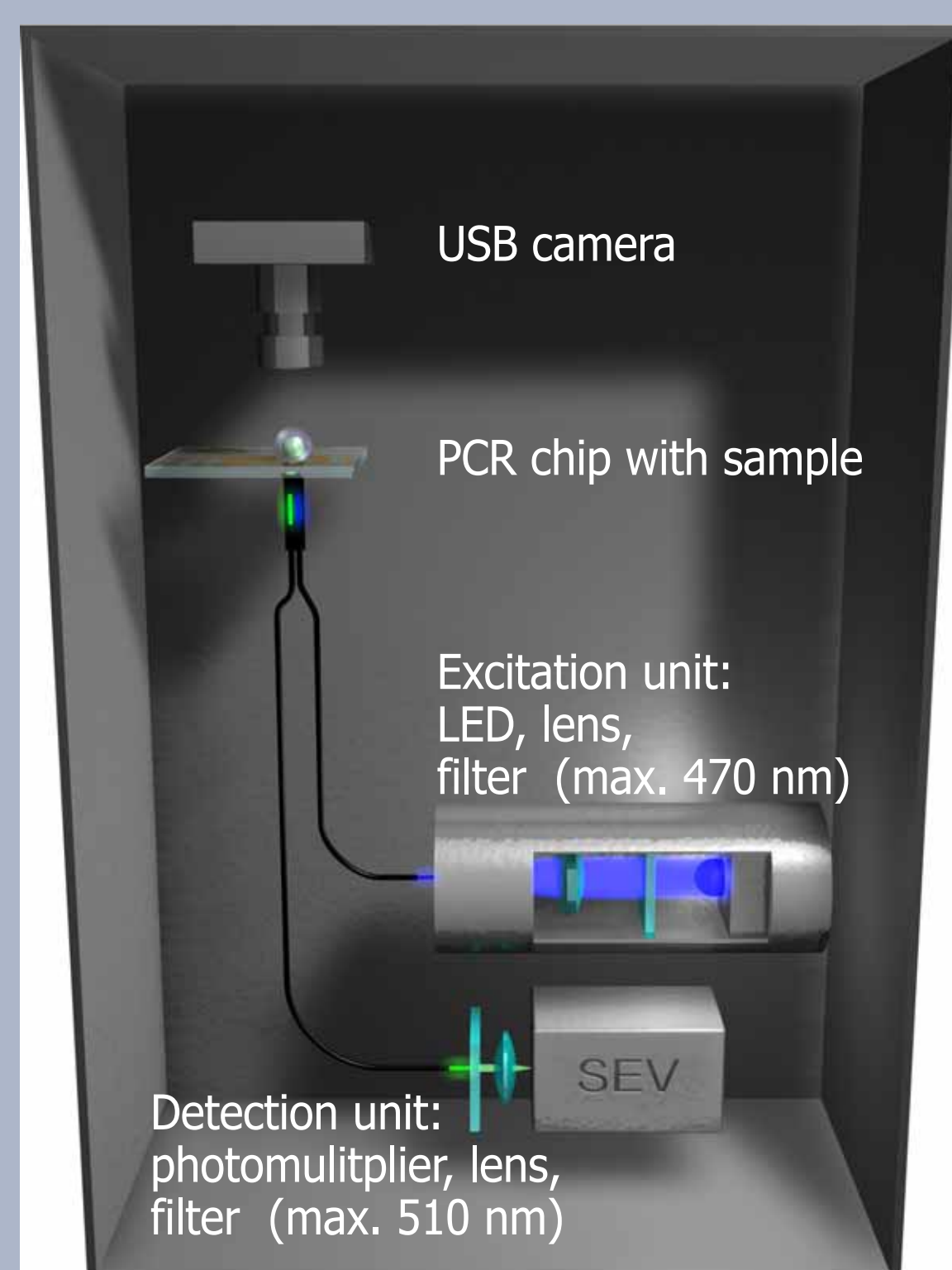


During the development of PCR micro chips at our institute (IPHT) various strategies were used. Of particular importance were thereby the stationary (fig. left) and through-flow (fig. right) PCR chips. The fabrication of PCR micro chips is based on the micro system technology. Importantly, the micro fabrication technique also provides a possibility for integrating various functional components on the same chip.

micro chip for through-flow PCR



## PCR on stationary 2D-PCR-Chip with integrated Real-Time Detection

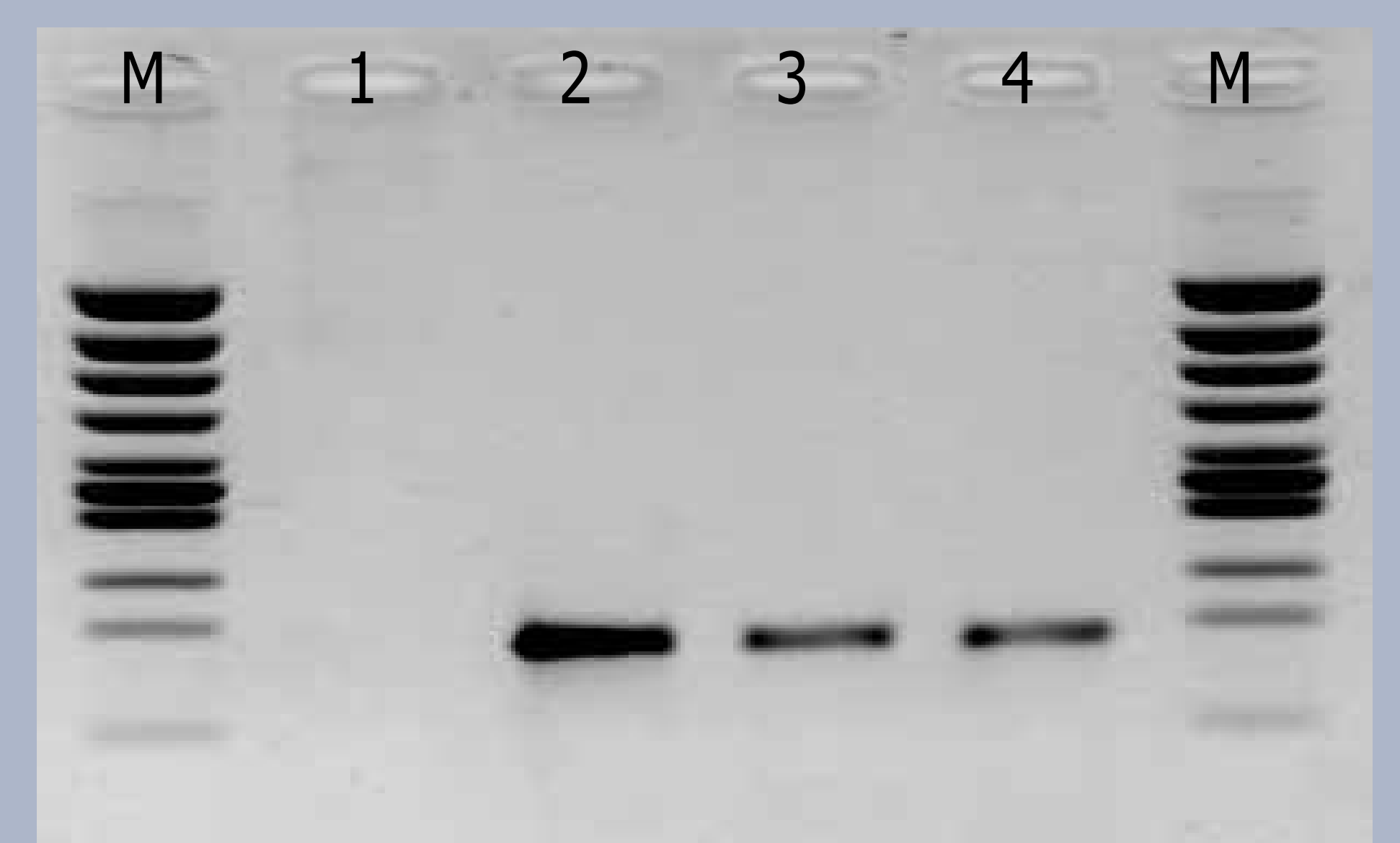


On-chip real-time PCR has been proven to provide the same sensitivity and quality of results as conventional systems. But in contrast, due to the high cooling and heating rates, a run of 45 cycles is completed after 23 minutes. At the same time the chip features a very low power consumption and enables on-site analysis.

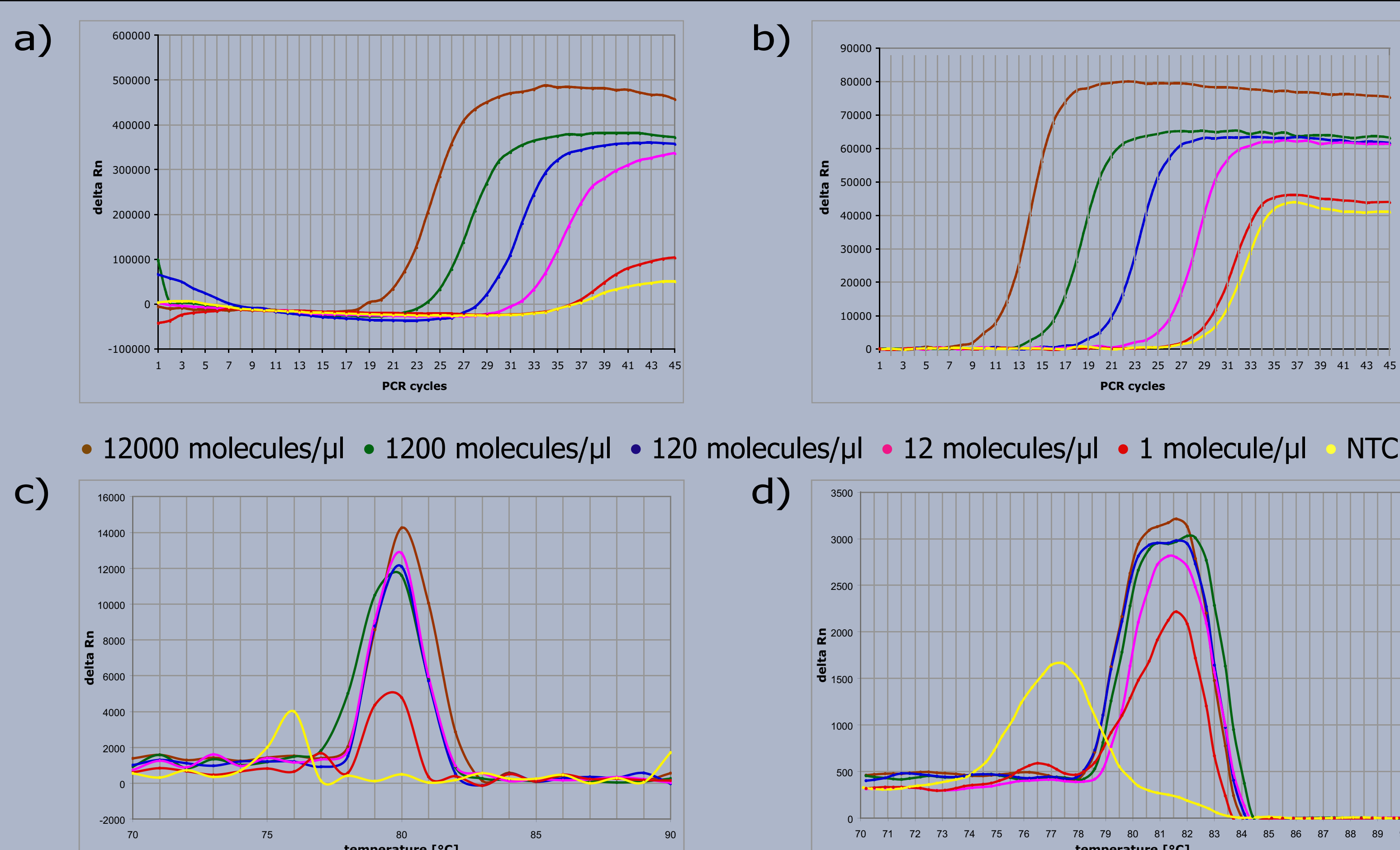
For real-time detection on the chip (fig. left) we demonstrate results, obtained with Sybr-Green as fluorescence dye. The detection limit was by 1 DNA molecule (fig. a-d) in a sample volume of 1-5  $\mu$ l. In further works we will increase the number of sample/detection sites on the chip for more application areas.

## One-step RT-PCR in a through-flow micro reactor

Our micro chip system for through-flow RT-PCR integrates reverse transcription, hot start activation and cDNA amplification in a single chip module. For the high-throughput analysis of PCR or RT-PCR samples we generate a segmented flow on the fluidic chip (fc). A interesting area of application of the RT-PCR is clinical diagnostics. Therefore, we established a RT-PCR system (fig. below) to detect the oncogen region of Human Papillomavirus (HPV) 16 genome. The vision of that project is the establishment of a system to detect single disseminated tumor cells in the blood of patients with cervical carcinoma. Our next aim in that project will be the commissioning of a Real-Time detection unit to analyze the PCR/RT-PCR products on the through-flow micro reactor. So it will be possible to reduce the analysis times of the through-flow PCR.



Gel electrophoresis analysis of HPV one-step RT-PCR in through-flow micro reactors with different flow regime in comparison to a commercial thermocycler; M marker, 1 NTC, 2 reference cycle, 3 RT-PCR fc continuous flow, 4 RT-PCR fc segmented flow



Comparison of the detection at different DNA concentrations between our stationary chip thermocycler and a commercial thermocycler as reference system (ABI 7300, Applied Biosystem).

a) Real-Time detection on stationary Chip; b) Real-Time detection of the commercial cyclers; c) Melting curves of the PCR-product on the stationary chip; d) Melting curves of the PCR-product in the commercial cyclers

## CONTACT

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