Application Brief

Microfluidic Electrical Impedance Spectroscopy. Measured.

Key Benefits

- Probe impedance simultaneously at 6 frequencies
- Resolve fast microfluidic process on a 5 µs timescale
- Measure over a wide range from 1 mHz to 50 MHz
- Reduce background noise with differential current input

Typical Results and Schematics

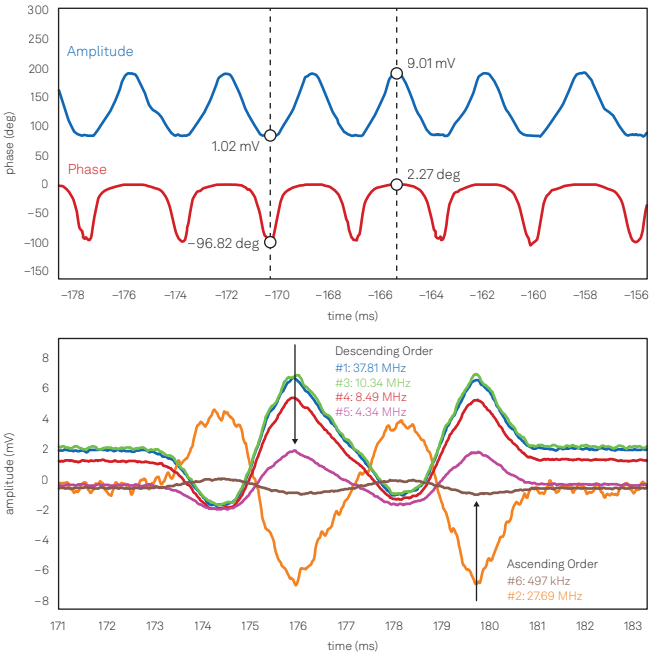

Figure 1. The current acquired with the HF2LI-based microfluidic measurement setup. Upper figure: single-frequency current and phase at 10 MHz. Lower figure: current acquired simultaneously at 6 frequencies. The transimpedance gain in both figures is set at 1 kV/A.

Why choose the HF2LI?

- Simplified setup by combining detection and sorting together on the same instrument
- Included LabOne® software for data acquisition and processing
- Automated workflow thanks to 5 APIs (Matlab®, LabView®, .NET, C, Python)
- Used independently or as part of a turn-key system

Measurement Strategies

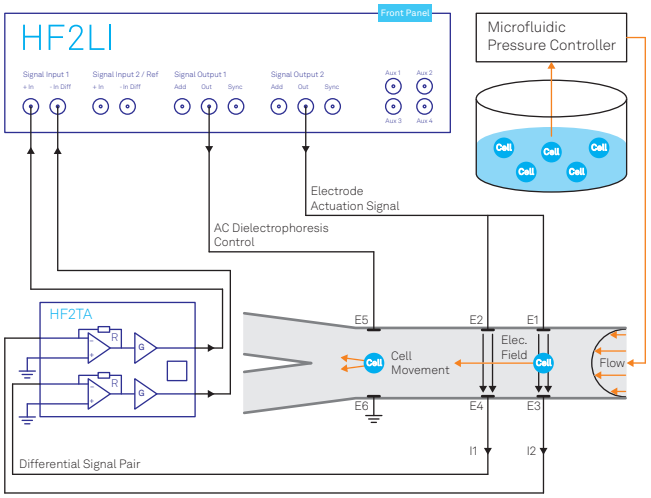

Figure 2. A typical measurement setup where the Zurich Instruments HF2LI and HF2TA measure the differential current from the passing analyte in a microfluidic channel.

Measuring particles or cells in a microfluidic flow requires a high sensitivity and a fast response. As the analyte enters and exits the differential electrode pairs in the microfluidic chip, a peak and a trough in current are observed (figure 1). With a differential input, the signal from the surrounding fluid is suppressed, meaning each cytometry event can be resolved with reduced noise.

The HF2LI Lock-in Amplifier plays a key role for electrical impedance spectroscopy measurements in a microfluidic setup (figure 2). With the LabOne Plotter or the data acquisition (DAQ) module, it is possible to record multi-frequency impedance data on a 5 µs timescale. Full impedance spectra can be acquired between 1 mHz and 50 MHz thanks to the LabOne Sweeper module.

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