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Sommario/riassunto	The most commonly used measurement technique for electrophysiology is the patch clamp technique. While this measurement technique allows the precise investigation of the communication taking place through ion channels, it has some undesirable drawbacks such as the local destruction of the plasma membrane, a low success rate and an elaborate experimental procedure. To avoid these drawbacks, in this work a new non-invasive microfluidic platform for electrophysiological research (NIMEP) was developed with regard to the activity of ion channels. This novel approach is based on the non-invasive measurement of the total current through the cell membrane and provides a possibility for an automated investigation of the individual cells. In addition, the investigated cell can be used for other applications, since the cell remains in an intact state before and after the test.