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Single Channel Activity from Ion Channels in Engineered Tethered Bilayer Membrane Arrays HENK KEIZER, BRIAN DORVEL, JOANNA LONG, University of Florida, DANIEL FINE, ANANTH DODABALAPUR, University of Texas at Austin, INGO KÖPER, WOLFGANG KNOLL, Max Planck Institute, PETER ANDERSON, RANDOLPH DURAN, University of Florida —
The demand for rapid *in situ* detection of chemical and biological analytes at high sensitivity has increased interest in the development of biosensors like the commercially available compact glucose sensor. Engineered membrane bound ion channels are promising biological receptors since they would allow for the stochastic detection of analytes at high sensitivity, they can be mutated to alter sensitivity, and they produce a well-defined read-out that is inherently suitable for digitization. In order to perform stochastic sensing it is necessary to be able to measure the ion currents associated with single ion channel opening and closing events. Although sensors based on supported bilayers containing various pore forming proteins have been described, none of these systems have recorded single channel activity. Here we describe the measurement of stochastic activity from synthetic single ion channels, based on the nicotinic acetylcholine receptor (nAChR) from *Torpedo californica*, inserted into individual pixels of a microelectrode array device. The limited size of the gold sense pad surface, 100x100 μm, and the electrical stability of the overlying lipid bilayer membrane make each pixel sensitive enough to measure single ion channel currents in the picoampere range.

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