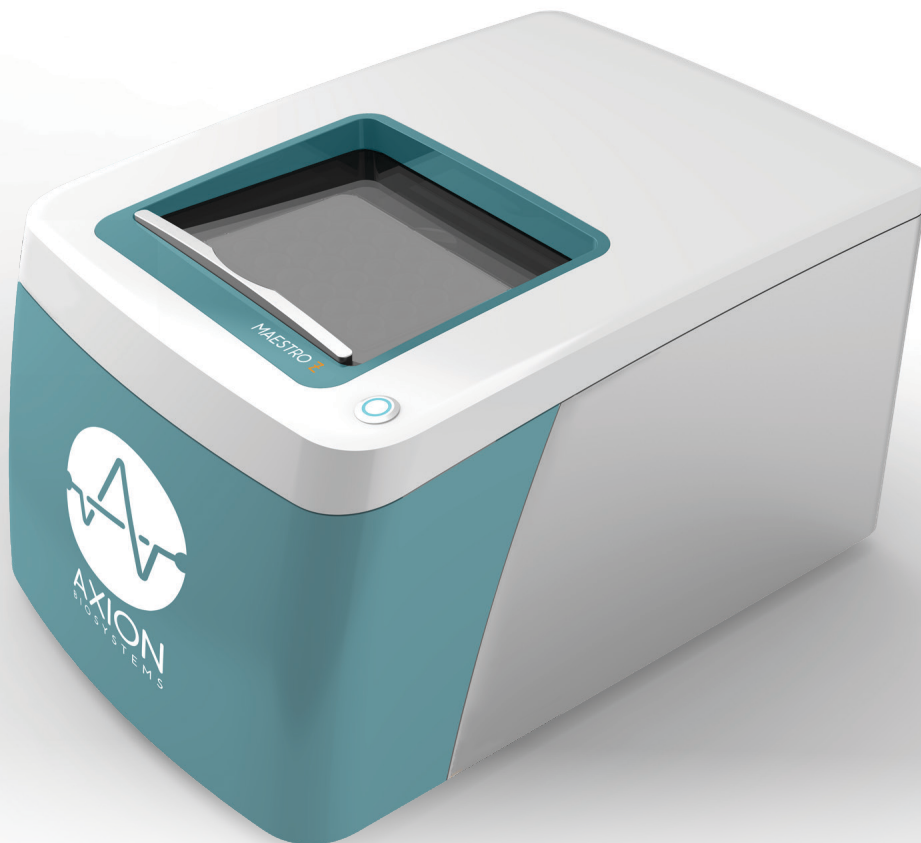




AXION
BIOSYSTEMS
Imagine • Explore • Discover

MAESTRO Z

TRACK CELL PROLIFERATION, MORPHOLOGY, AND VIABILITY
LABEL-FREE AND IN REAL-TIME



Imagine • Explore • Discover

MAESTRO Z | THE TECHNOLOGY

Cell-based assays enable rapid evaluation of human biology *in vitro*, with substantial advantages in throughput and cost over tissue or animal models. However, many cell-based assays are endpoint assays, limited to a single snapshot in time. Axion BioSystems' Maestro Z platform offers impedance-based cell analysis for real-time, continuous, label-free monitoring of your cells. Continuous data reveals the kinetics of cell-cell interactions and cell-drug responses for better mechanistic understanding without the time- and cost-intensive process of repeating multiple endpoint assays.

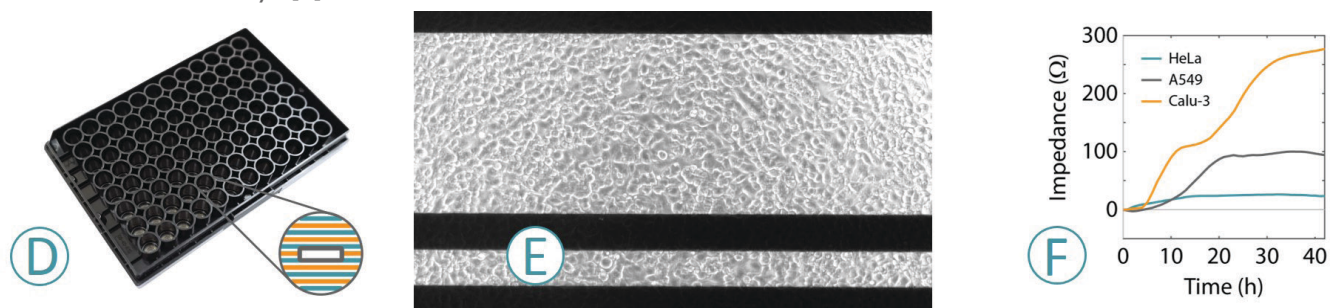
MEASURE PROLIFERATION, MORPHOLOGY, AND VIABILITY, IN REAL-TIME

How Maestro Z works

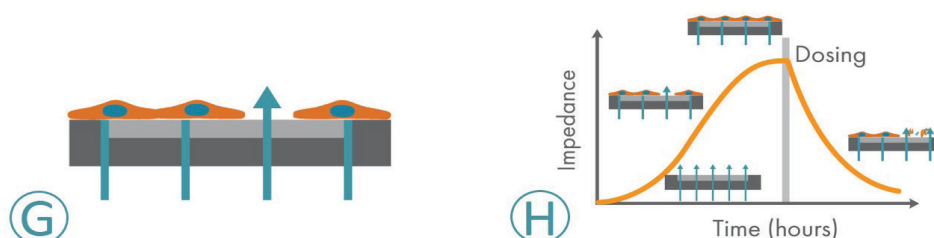
Getting started with Maestro Z couldn't be easier. Culture your cells in an Axion multiwell CytoView-Z plate [A]. Load this plate into the Maestro Z system and allow the environmental chamber to automatically equilibrate [B]. Analyze changes in cell proliferation, morphology, and viability in the CytoView-Z plate label-free and in real-time with AxIS Z software [C].



Axion's 96-well CytoView-Z plate has a recording electrode embedded in the culture surface of each well [D]. The Maestro Z platform uses impedance measurements (ohms, Ω) to quantify the presence of cells on the electrode [E]. To measure impedance, small electrical signals are delivered to the electrodes. Cell attachment, spreading, and cell-cell connections block these electrical signals and are detected as an increase in impedance. Impedance is also sensitive to subtle changes in cell conformation, such as those caused by receptor-mediated signaling or cell morphology. Since impedance is non-invasive and label-free, impedance assays can be used to quantify dynamic cellular responses over minutes, hours, and days [F].

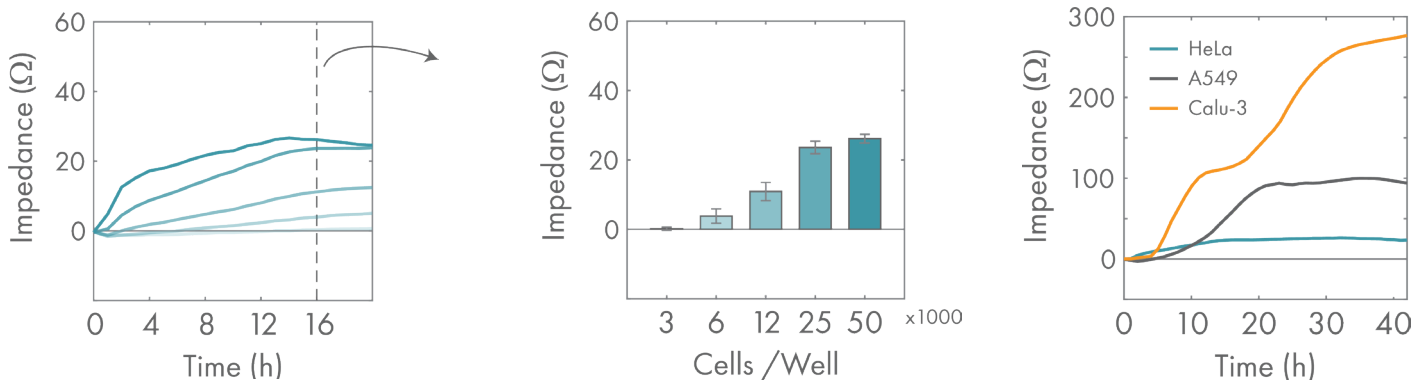


Impedance measures how much electrical signal (teal-colored arrows) is blocked by the electrode-cell interface [G]. When the electrode is uncovered, electrical signal easily passes (thick arrows) and the impedance is low. When cells cover the electrode, less electrical signal passes (thin arrows) and impedance is high. When cells die or detach, the impedance decreases back towards baseline [H].



UNIQUE FUNCTIONAL PROFILE OF YOUR CELLS

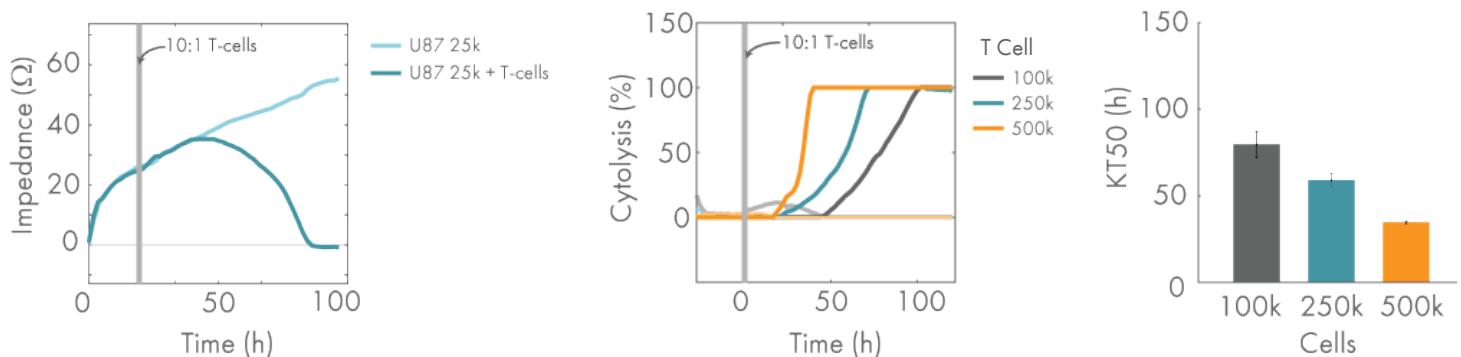
Cells grow, attach, and interact differently based on their biological function. Collectively, these properties result in a unique cellular profile. The Maestro Z impedance assay allows you to track this cellular profile, and to distinguish cells based on type, density, morphology, and attachment. The cellular profile can also be used to ensure cell quality and purity, quantify growth rates, and optimize assay timing. All of this information is available without complicated experimental setup or analysis. With the push of a button, the Maestro Z system will maintain environmental control and continuously, non-invasively monitor your cells as long as needed, while providing real-time growth curves and simple endpoint plots.



HeLa cells were seeded into the CytoView-Z plate at varying densities and monitored on the Maestro Z system during the attachment, spreading, and proliferation phases (left, middle). Growth curves for HeLa, A549, and Calu-3 cells illustrate distinct cellular profiles.

TRACK IMMUNE CELL-MEDIATED KILLING

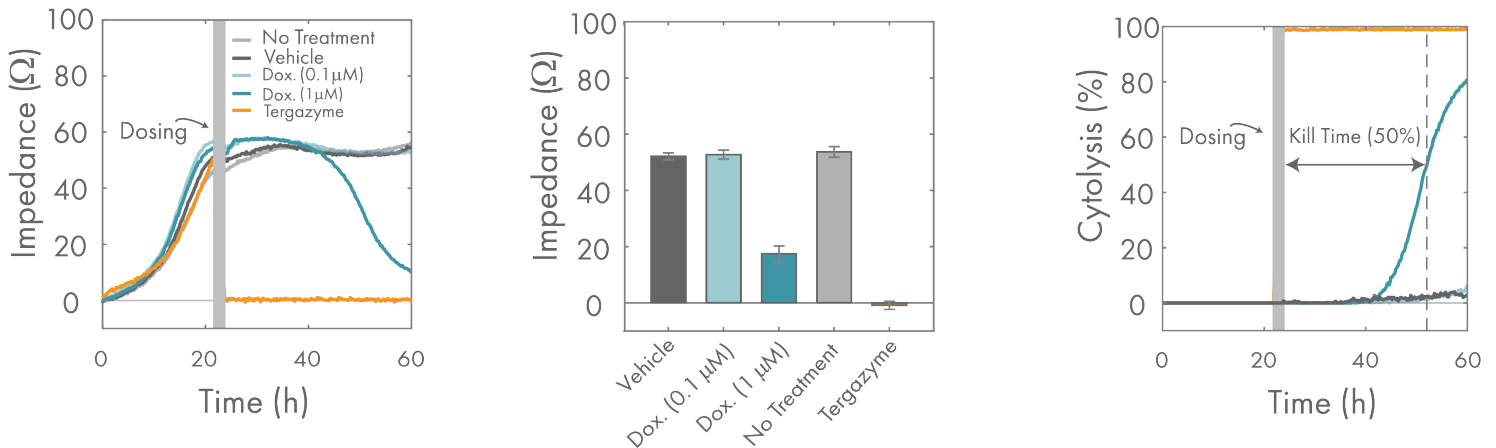
Glioblastoma (GBM) is an aggressive form of brain cancer that has no effective treatments and a prognosis of only 12–15 months. Immune system effector T cells hold promise for future cancer therapy due to their high specificity and innate cytotoxicity. The Maestro Z impedance assay provides a sensitive, label-free, nondestructive method to continuously monitor cancer cell proliferation and immune cell-mediated cytotoxicity, providing a powerful means of assessing immune cell potency.



U87MG glioma cells were seeded into the CytoView-Z plate at three different densities ($n=12$) and impedance was continuously monitored on the Maestro Z. After 24 hours, activated human T-cells were added in a 10:1 ratio to each well ($n=4$ wells for each cell density). The addition of activated human T-cells resulted in a decrease of the impedance signal consistent with T-cell-mediated lysis of the U87 cells, while untreated wells continued increasing, as shown (left) for 25,000 U87 cells. Percent cytolysis was tracked in real-time (middle), enabling computation of Kill Time 50% (KT50) for each density (right). A higher density of T-cells led to faster killing of U87 cells.

DYNAMICS OF CYTOTOXICITY

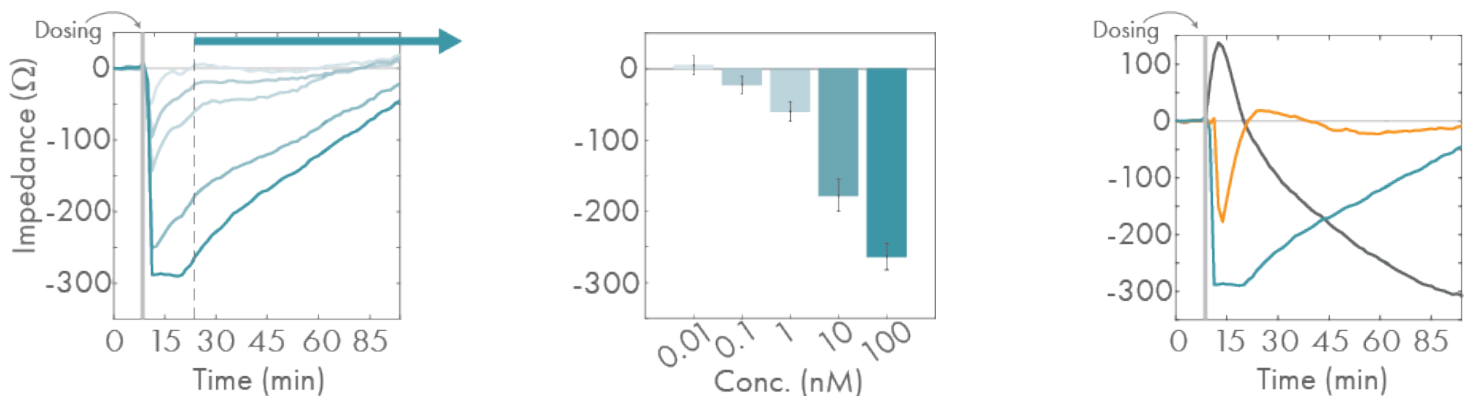
When testing a new drug or cell therapy, endpoint assays can tell you whether the cells are dead or alive, but they cannot reveal the dynamics or mechanisms behind the cellular response. With label-free, non-invasive, continuous monitoring, the Maestro Z impedance assay allows you to capture the entire time course of cytotoxicity, revealing not only the degree, but also the dynamics and rate of cell death. Often, the kinetics of the cell response give the most insight into the efficacy and mechanism of a compound.



After application of doxorubicin (Dox.), the impedance measurements revealed the dynamic response of the A549 cells (left, middle). Using on-plate controls for cell growth (No Treatment Control) and cell death (Tergazyme), the percent cytotoxicity was tracked in real-time throughout the time course of the response (right).

MONITOR RAPID RECEPTOR-MEDIATED SIGNALING

Cell signaling pathways communicate messages from outside the cell. When extracellular signal molecules bind receptors on the cell surface, they initiate signaling events inside the cell that determine cell behavior. G-protein-coupled receptors (GPCRs) are the largest class of transmembrane receptors. GPCR binding results in conformational changes and downstream responses that can be measured by impedance. These small changes often occur rapidly, but can last minutes to hours with significant physiological consequences. The Maestro Z impedance assay allows you to sensitively and continuously measure the dynamics of cell signaling over minutes to hours without disturbing the cell biology.



Calu-3 cells dosed with Isoproterenol (teal), a potent beta-adrenergic receptor antagonist, revealed a short-term dose-dependent decrease in impedance (left). At 20 minutes post-dose, the cells dosed with the highest concentration showed the lowest impedance, while cells dosed with the lowest concentration had already returned to baseline (middle). Cell signaling dynamics varied with compound mechanism (right). Histamine (orange, 100 μ M) showed a short rapid decrease in impedance, while Cytochalasin D (gray) caused an initial increase and subsequent decrease in impedance related to actin inhibition and cell cycle arrest.

MAESTRO Z | THE ADVANTAGE

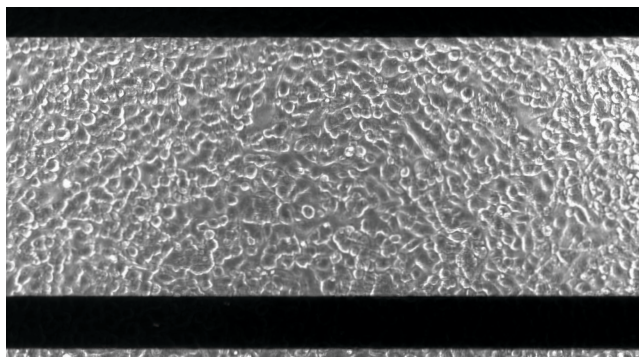
The Maestro Z system is the world's most advanced electrode-based real-time cell analysis system. Featuring a newly designed environmental chamber, and the next generation in data acquisition and analysis software, Maestro Z is the complete platform for real-time cell analysis.

TAKING CARE OF YOUR ASSAY... SO YOU CAN FOCUS ON THE SCIENCE



"ONE BUTTON SETUP"

Temperature and CO₂ levels automatically adjust on plate docking. Plate usage is logged via an integrated plate barcode scanner for convenient experiment tracking.



SEE YOUR CELLS

Sometimes you just want to look at your cells under a microscope. Maestro Z's 96-well plates have a viewing window in each well which allows cell visualization.

CONTINUOUS CELL MONITORING

96 simultaneous live recordings from your cells. Now you can track cell proliferation, morphology, and viability in real-time, even when you are out of the lab.

POWERFUL DATA ANALYSIS

AxIS Z simplifies the setup, execution and analysis of your experiments. Now you can focus on the science rather than the data analysis.



PRECISE ENVIRONMENT

No need for an additional cell culture incubator, saving valuable lab space and money. Maestro Z's smart environmental chamber finely controls heat and CO₂ while rejecting electrical noise and mechanical vibrations.

MAESTRO Z



96
ELECTRODES

0.5 TB

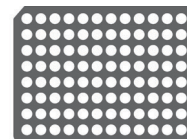
0.5 TB storage space

37.0 °C
5.0% CO₂

Integrated Environment Chamber



Turn-key data analysis software



96- well assay plate



Viewing window for cell visualization