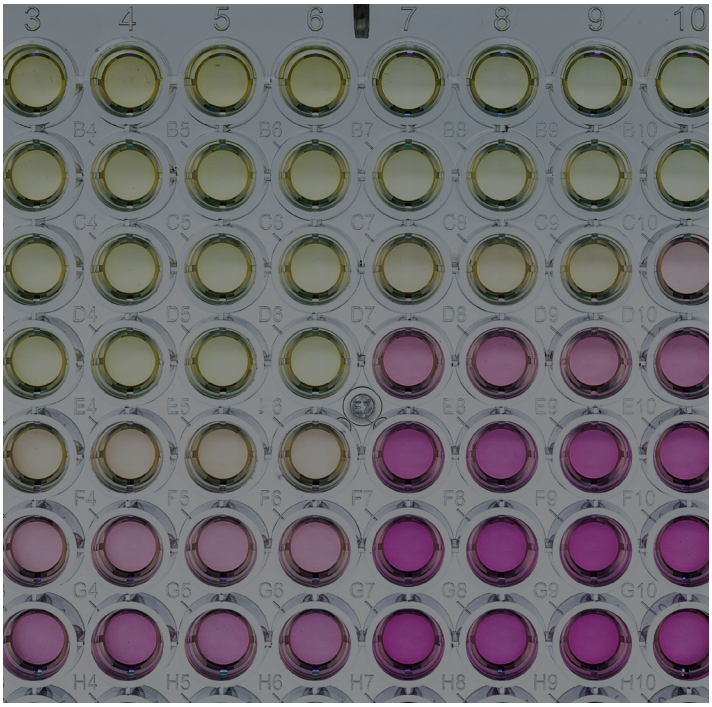


VOLTA Scanner for pharmacological safety profiling, drug discovery and personalized medicine

At the cellular level, biology happens quickly! For example, the electrochemical action potentials responsible for the transmission of nerve impulses last approximately one millisecond. Detection and functional analysis of transient cellular processes requires instrumentation with temporal resolution on the same timescale as such transient activity. To address these requirements, Lumencor's VOLTA Scanner provides the capacity to simultaneously monitor cellular functions with sub-millisecond temporal resolution across 96-well or 384 well microtiter plates.

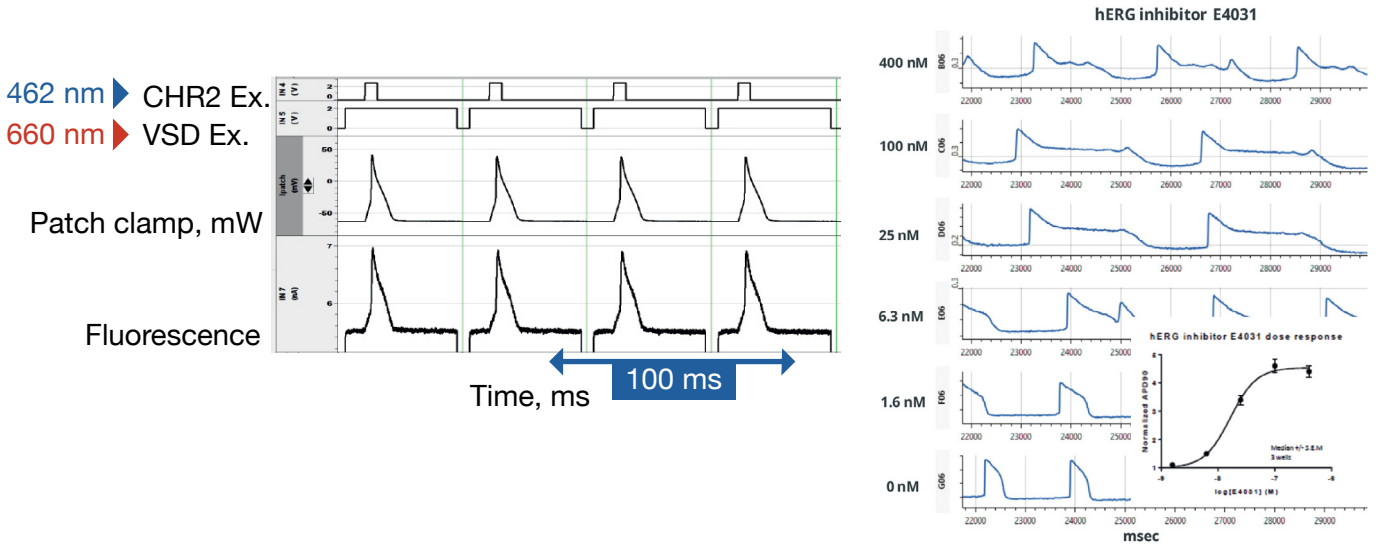
Kinetic assays of cellular activity generally use cells in which the receptor or ion-channel responsible for mediating the activity of interest are transgenically expressed. Activity is initiated by fluidic addition of a small molecule agonist, and the activity elicited is detected by an intracellular fluorescent probe. Conventional microplate readers for high-throughput, cell-based assays therefore combine an automated multichannel pipetting system to deliver the stimulus together with an optical system to record the fluorescent probe response. In contrast, VOLTA's dual-laser optical system performs both functions – stimulation and detection.

A typical VOLTA application for pharmacological safety profiling is illustrated in the schematic above and the kinetic data shown on page 2.

The assay uses induced pluripotent stem cell cardiomyocytes that express a target ion-channel and channelrhodopsin (ChR2), and are labeled with a voltage-sensitive fluorescent dye (VSD). A 50-ms pulse of 462 nm light is absorbed by ChR2, initiating a transient change in transmembrane voltage. This change in transmembrane voltage is detected by continuous monitoring of VSD fluorescence with 0.1 ms resolution. The functional effects of drug-binding to the target ion-channel are manifested as changes in fluorescence-detected transmembrane voltage patterns as the drug concentration is increased from one microplate well to the next.

Applications of the VOLTA Scanner are not limited to assays based on transmembrane voltage responses to ChR2 stimulation. For example, changing the photostimulation laser output to 405 nm would enable analysis of cellular functions linked to the neurotransmitter glutamate using the photoactivatable precusor 4-methoxy-7-nitroindolinyl (MNI)-caged L-glutamate.

For more information on the VOLTA Scanner please contact us at info@lumencor.com. To receive a purchase quotation for a VOLTA Scanner, please submit our online quotation request form.



LEFT: Upper panels show the timing of illumination at 462 nm (photostimulation) and 660 nm (voltage-sensitive dye excitation). The lower two panels demonstrate the equivalence of optical detection via VSD fluorescence with electrical detection using patch clamp electrophysiology.
RIGHT: Pharmacological safety profiling data. VSD fluorescence response traces are shown for 6 samples with drug concentrations increasing bottom to top. As drug concentration increases, the return of the VSD response to its basal level following stimulation shows increasing delays and perturbations. Physiologically, this effect is referred to as QT prolongation. Data courtesy of Photoswitch Biosciences.

Features and Operating Characteristics:

Features	Details
Light Sources	462 nm and 660 nm diode lasers*
Microplate configurations	96- or 384-well
Sample Introduction	Side loading
Data Readout	Average fluorescence intensity per well versus time
Data Collection	96 wells read in parallel. 384 wells in 4 sequential 96-well reads.
Temporal Resolution	10 kHz data sampling rate
Detector	Photodiode array, spatially registered to microplate wells
Temperature Control	Sample compartment controlled 22–37°C
Onboard Computer & SW	Intel Core i7, 16 B RAM, Windows 10 LTSC operating system, data acquisition and analysis software included.
Power Supply Requirements	100-240 V AC, 50-60 Hz, 5 A
Warranty	24 months
Dimensions (W x L x H)	14.2 in x 28.2 in x 13.5 in (361 mm x 716 mm x 343 mm)
Weight	91.9 lbs / 41.7 kg

* These specifications can be customized according to assay requirements