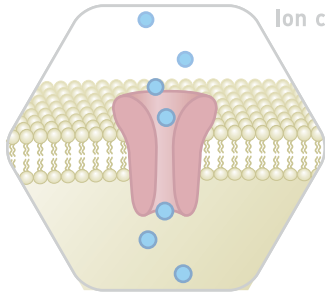
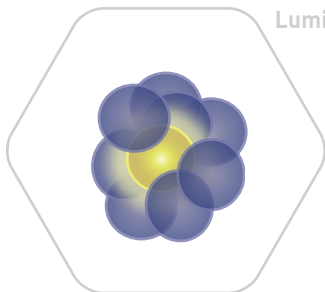


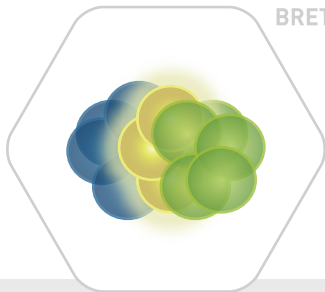
GPCR



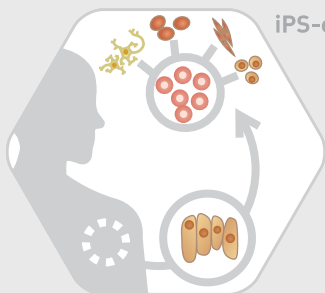
Ion channel



Luminescence



BRET/FRET



iPS-cell



Fluorescence/luminescence plate imager using a high sensitivity two-dimensional sensor (camera)

FDSS[®]/μCELL

Functional Drug Screening System C13299

Measurement under uniform conditions with no time lag by simultaneous addition and reading in all 96 or 384 wells.

FDSS/ μ CELL is a laboratory screening system that compactly integrates technologies developed in drug discovery screening, enabling a purpose-built system that is simple to use.

Simultaneous measurement and analysis of the kinetics of a sample's fluorescence or luminescence intensity in all wells at the time of compound addition are made possible by the high sensitivity two-dimensional sensor (camera) and dispenser head (96 tip type/384 tip type). Screening various compounds at high throughput is enabled by measurement under the same conditions with no time lag between wells.

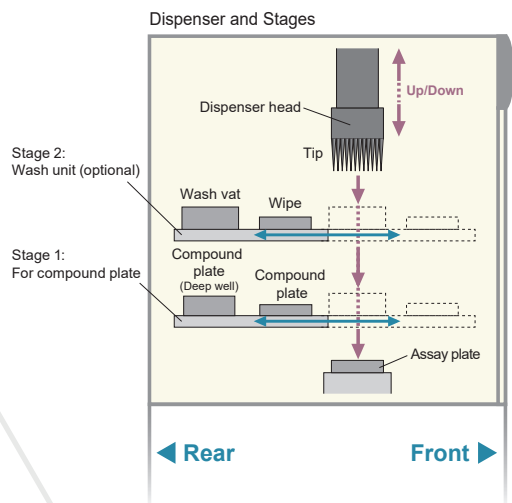
Main features

- Suitable for fluorescence/luminescence analysis
- Simultaneous addition and reading in 96 wells/384 wells
- Enables a wide range of measurements with excitation light sources of various wavelengths
- Long life, high power LED excitation light source
- Suitable for FRET or BRET by changing wavelength
- High speed data capture of 5 ms maximum (optional)
- Simultaneous electrical stimulation and reading in 96 wells (optional)
- External control option available for automation
- Temperature can be maintained at +35 °C to +37 °C by installing heater unit (optional)
- CO₂ incubation (optional)
- Waveform analysis (optional)

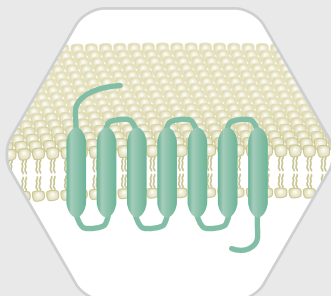
Detection unit enabling simultaneous addition and reading



Automatic wash and wipe functions



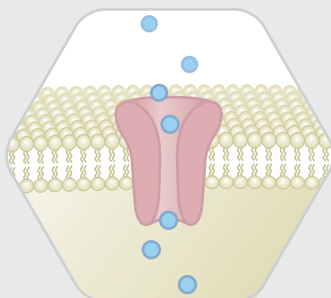
Applications



1. GPCR

GPCRs (G protein-coupled receptors) play a major role in cell signaling, and many GPCR-targeted medical drugs have been developed. FDSS/ μ CELL is capable of detecting messengers, such as Ca^{2+} and cAMP, which are major contributors to the GPCR signaling system by using fluorescence and luminescence probes. FDSS/ μ CELL allows simultaneous dispensing and kinetic measurement of compounds in whole microplate wells, thus realizing high throughput screening.

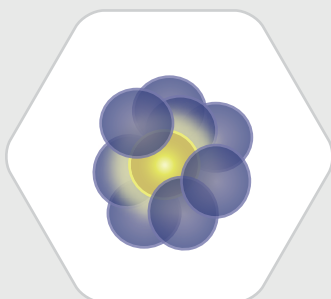
- Ca^{2+} measurement: Fluo-4, Fluo-8, Cal-520, Aequorin
- cAMP measurement: Glo-Sensor



2. Ion channel

Ion channel, a class of transmembrane proteins that allow certain ions to pass through the cellular biomembrane (in or out of the cell), regulate cellular functions and are involved in the development of cardiovascular, neurologic and metabolic diseases. FDSS/ μ CELL performs high throughput drug screening using voltage-sensitive fluorescent dyes or fluorescent indicators for different ions.

- Na^{+} measurement: ANG-2, Corona-Green, Corona-Red, Sodium-Green
- K^{+} measurement: FluxOR
- Cl^{-} measurement: MEQ, MQAE, YFP
- Membrane potential measurement: FluoVolt, Di-8-ANEPPS, DiBAC4 (3)



3. Luminescence

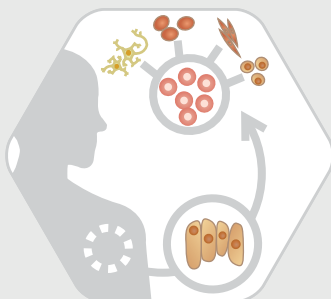
The merits, i.e., high sensitivity and low noise, of assays using luminescence probes have led to the wide application of such assays in various luciferase assay systems and Ca^{2+} assays using aequorin. FDSS/ μ CELL simultaneously performs different assays using luminescence probes on a single microplate with the use of highly sensitive two-dimensional sensors (camera), allowing for high throughput screening without bothersome time lags after substrate addition.



4. BRET/FRET

Biosensors based on the principle of resonance energy transfer that use GFP (green fluorescence protein) or Luc (luciferase) are utilized as a tool to measure various intracellular signal transmissions including ionic concentrations and signaling molecular activities. FDSS/ μ CELL simultaneously performs BRET (bioluminescence resonance energy transfer) measurements, a luminescence-based approach, and FRET (fluorescence resonance energy transfer) measurements, a fluorescence-based approach, on a single microplate using highly sensitive two-dimensional sensors (camera) and an automatic filter changer.

- BRET: BRET1, BRET2, Nano-BRET
- FRET: C/Y FRET, VSP, Cameleon



5. iPS-cell

Various differentiated cells have recently been created from iPSC (induced pluripotent stem cell), and this increasingly allows for the conduct of cell-based assays using human-derived native cells. In particular, iPS Cardiotoxicity, iPS Neurotoxicity, and iPS Hepatotoxicity assessments have been increasingly performed as safety evaluation of compounds. FDSS performs high throughput toxicity screening.

System components



Combinations of components support wide range of applications.

* Computer table is not included.

Highly sensitive two-dimensional sensor (camera)

A high sensitivity/high speed camera with a wide sensitivity range from fluorescence to luminescence. Performs various assays with high throughput as a fluorescence/luminescence plate imager.

Because all wells of the microplate are read simultaneously, there is no time lag in the fluorescent indicator or in measurement between wells after substrate addition. To measure rapid fluorescence kinetics, data can be captured at intervals of up to 5 ms by using the high-speed data capture function (optional). It is effective when sampling in a short time is required, such as with high-speed voltage sensitive fluorescent dyes and evaluation of iPS cell derived cardiomyocytes.



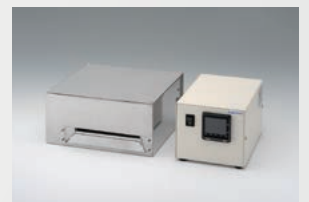
▲ Camera for fluorescence/luminescence detection: ImagEM X2 EM-CCD camera C9100-23B



▲ Camera for fluorescence detection: ORCA-Flash4.0 V3 Digital CMOS camera C13440-20CU

Heater unit

When iPSC differentiated cells and other native cells are used, it is important to maintain a stable temperature environment in maintaining physiological functions. The heater unit can keep temperature near the assay microplate at +35 °C to +37 °C, and is effective for systaltic analysis of cardiomyocytes.



▲ Heater unit A11529-15

CO₂ incubator

The assay plate is simply enclosed and CO₂ mixture is supplied inside. This keeps the CO₂ concentration around the plate at 5 % to 6 %.

Robot connection (automation)

Automated assay by robot connection is an important function for consecutive execution of various measurement sequences. Stable automatic measurement is realized by loader designs considering each company' s robot. Please contact us to learn about compatible models.



▲ Applicable to each company's robot

Fluorescence optical unit Patented

An optical system for fluorescence measurement that is integrated with a unique illuminator glass wave excitation optical system. It is used in combination with an LED excitation light source unit. It provides high S/N fluorescence detection that is maintenance-free with a long life. A complete line of excitation light source units can be easily replaced according to the purpose.



▲ Fluorescence optical unit M11031-02

Dispensing unit (96/384 tip type)

A dispenser head that can dispense compounds simultaneously into all wells of 96/384 microplates. Since all wells are dispensed at once, kinetic assays such as Ca^{2+} assays are performed at high throughput.



▲ Dispensing unit (384 tip type) A10118-26

Light source array unit (B,G)

A LED excitation light source that can output two wavelengths: Blue (480 nm) and Green (530 nm). Blue LED or Green LED can be used alone, and 2 wavelength measurement using a fluorescence filter changer or optogenetics by channelrhodopsin are also possible.



▲ Light source array unit (B,G) L11601-06

EFS pacing head * (96 ch)

Electric field stimulation using electrodes is an effective technique for pacing of cardiomyocyte and skeletal muscle cell pacing and neuronal oscillation. FDSS/ μ CELL simultaneously stimulates all wells of a 96 microplate with a pacing head using 96 multi-EFS electrodes. It can be used in contraction timing control of muscle cells such as cardiomyocytes and skeletal muscle cells, or in Ca oscillation control of nerve cells, etc.



▲ EFS pacing head (96 ch) A13029-01

* The FDSS/ μ CELL EFS system should not be used for optically detecting/monitoring change in transmembrane potential of the cells.
The FDSS/ μ CELL EFS system should not be used on any cell or cells in which the user or anyone else has expressed target ion channels.

Fluorescence filter changer unit

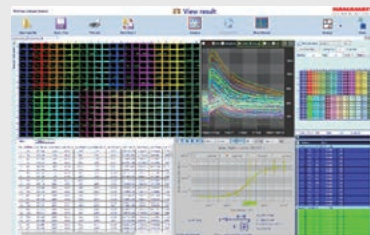
For measuring fluorescence and luminescence, measurement of dual wavelengths by energy transfer such as FRET and BRET is an effective method for ion channel and protein kinetic analysis. Dual wavelength measurement is performed with high throughput by the fluorescence filter changer installed in front of the sensor.



▲ Fluorescence filter changer unit A8472-07

Dedicated software

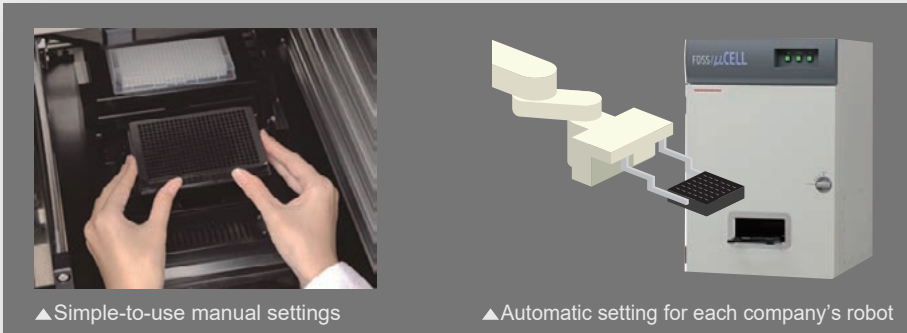
An assay design is easily constructed as a sequence from measurement to data analysis with easy-to-use measurement software. By using the waveform analysis function (for cardiomyocyte), it is possible to numerically analyze cardiomyocyte pulsation and the effects of drugs. All of the wells of a microplate can be analyzed at once, and it is effective for toxicity screening of compounds and evaluation of efficacy.



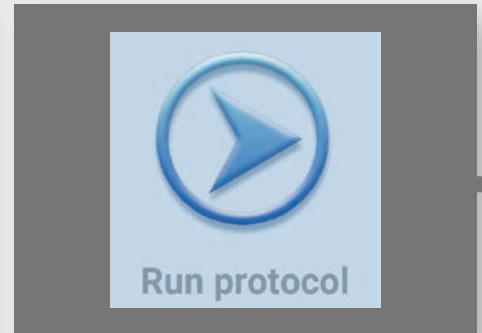
Measurement flow

Provides flexible assay design and simple assay workflow

Plate setting

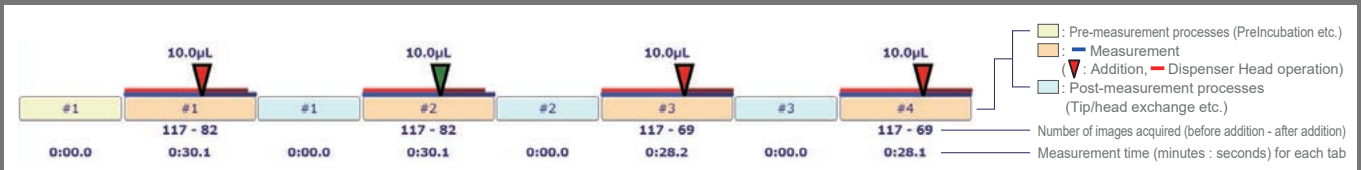


Data acquisition



Protocol setting

Call the assay protocol and set the number of measurements, measurement interval (measurement time), dispensing and washing conditions in the Kinetic Protocol mode. Operations from measurement to data output can be automated.



Protocol settings and display can be easily understood by combining the task tabs. Detailed measurement, dispensing and washing settings can be made for each task tab.
*Some tasks are washing, dispensing only, without measurement.

Period #1 | **Period #2** | **Period #3** | **Period #4**

Period: 0m 30.060s

Sampling interval

Interval (0.150s) | Sampling number: 117 | Time of period: 0m 17.550s

Base line Sampling: 0.150 Sec | Measurement Sampling: 0.150 Sec

Dispensing

Volume (µL): 10.0 | Speed and height: [Settings]

From: Compound | to: Assay

Expected time: 0m 17.4s / 0m 10.4s

Wash

Wiper: ON | Wipe: OFF | Wipe: OFF | Wipe: OFF | Wipe: OFF

Pacing

Expected time: 0m 09.3s

1. Frequency (Hz) | 2. Pulse width (ms) | 3. Number | 4. Wait time (s)

Column	1	2	3	4	5	6	7	8	9	10	11	12
Frequency (Hz)	10.00	20.00	1.00	100	100	100	100	100	100	100	100	100
Pulse width (ms)	10	10	10	10	10	10	10	10	10	10	10	10
Number	1	1	1	1	1	1	1	1	1	1	1	1
Wait time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Column Voltage (V): 0.1, 5.0, 5.0, 5.0, 5.0, 5.0, 5.0, 5.0, 5.0, 5.0, 5.0, 5.0

Set number of measured plates and interval (measurement time)

Number of measured plates (Sampling Number) and measurement interval (Interval) can be set separately before and after dispensing.
*If there is no dispensing, only the number of measured plates and measurement interval are set.

Settings for dispensing during measurement

The amount of liquid to be dispensed during measurement, the height from the bottom of the plate well, the speed, tip mixing, the source plate (source), and destination (plate position) are set.

Settings for tip washing after dispensing

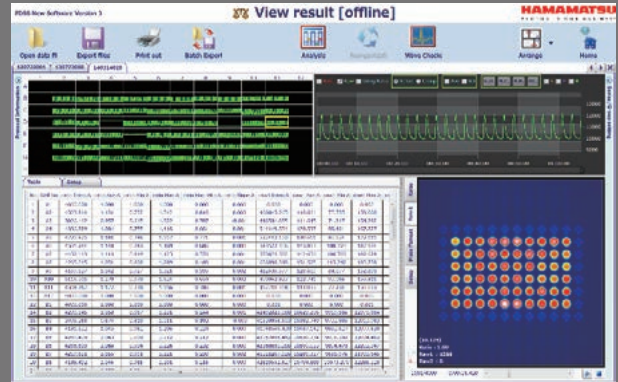
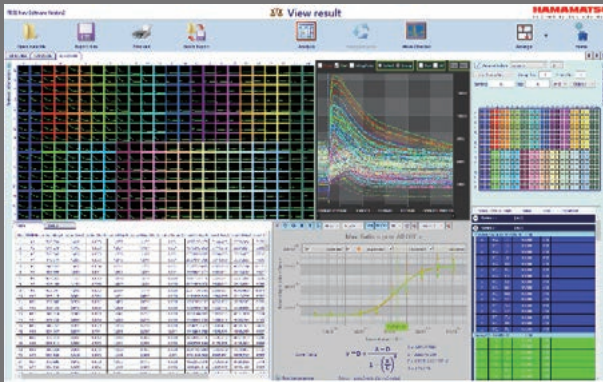
Tip washing is set after liquid dispensing.

Setting of electric field stimulation during measurement (EFS: Electric Field Stimulation)

Parameters (voltage, pulse width, frequency, number of pulses) of electrical stimulation. It is also possible to set by changing the voltage for each column.

*This function is available when electric field stimulation (EFS) pacing system M13040-01 is added.

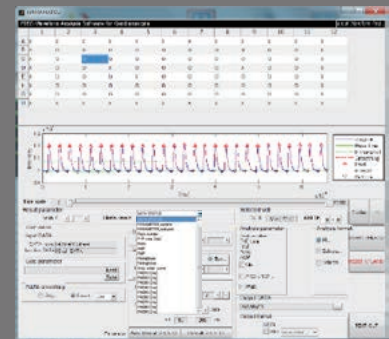
Data analysis



Various data processing and analysis are possible from the results of measurement

- Spatial correction between wells (spatial uniformity)
- Negative control correction
- Positive control correction
- Baseline subtraction correction (subtract bias)
- IC/EC graph calculation from multiple series (4 or 5 parameters may be selected)
- IC/EC graph calculation using Max, Min, Average and Max-Min in up to three time ranges in the same series
- Slope calculation to maximum range of 8
- Max, Min, Max-Min and Ratio calculation to maximum range of 8

Analysis of calcium transient waveform of iPS cardiomyocyte

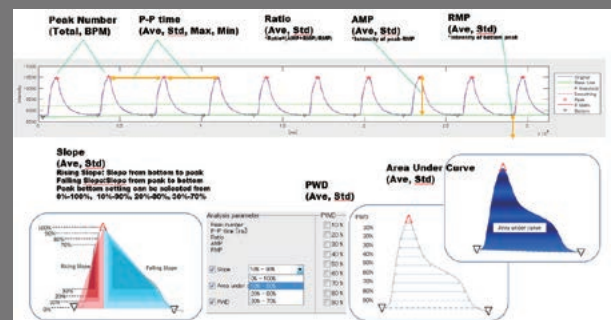
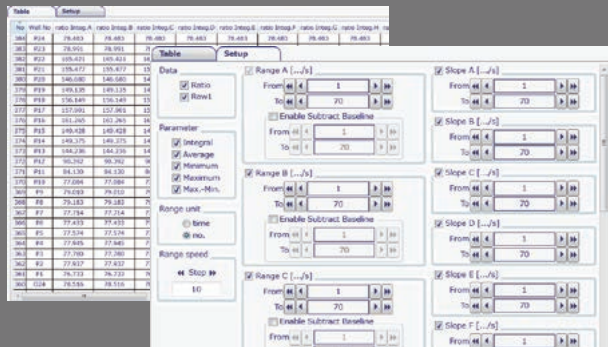
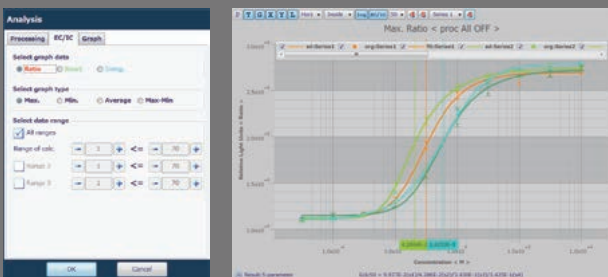


(Optional software U8524-12)

The items below can be output as text files in plate format.

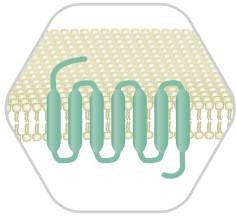
Main analysis items

- Waveform peak number (Peak Number: Total, BPM)
- Peak-to-peak time (p-p time: Ave, Std, Max, Min)
- Peak luminance value/bottom luminance value ratio (Ratio: Ave, Std)
- Peak amplitude {peak luminance value - bottom luminance value} (Amplitude: Ave, Std)
- Bottom luminance value (RMP: Ave, Std)
- Rise and fall slope (Rising/Falling Slope: Ave, Std)
- Peak pulse width 10 % to 90 % (PWD10, 20, 30, 40, 50, 60, 70, 80, 90)
- Peak total area (Area Under Curve: Ave, Std)



(Optional software U8524-12)

Examples of measurement and analysis in typical applications

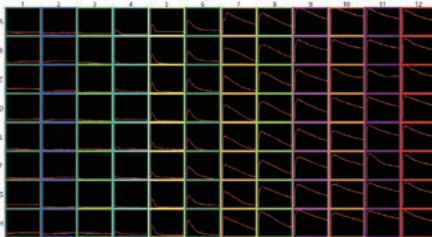


1. GPCR

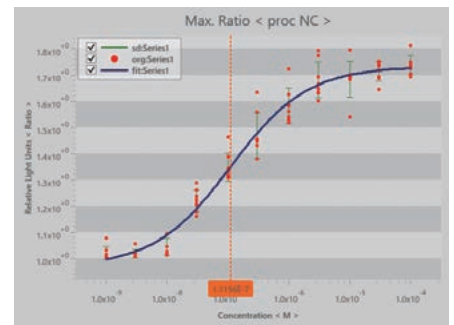
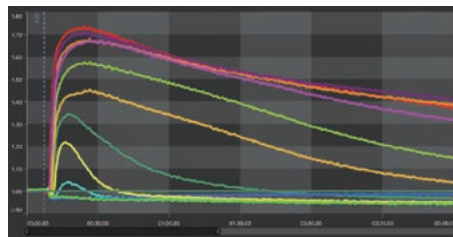
GPCR screening can be performed by intracellular Ca^{2+} assay, cAMP assay and β -arrestin assay.

Intracellular Ca^{2+} assay

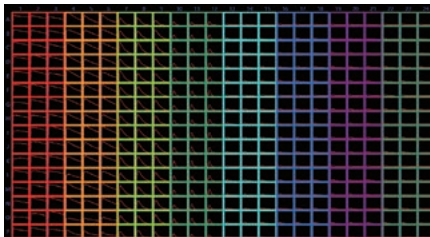
Evaluation of ATP dose response using Fluo-8 AM-stained CHO



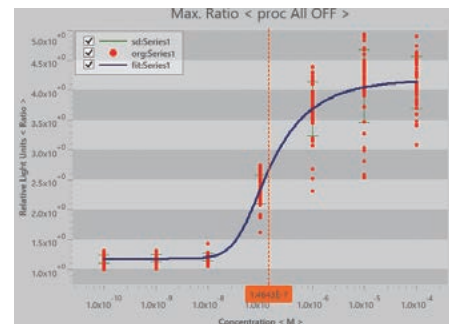
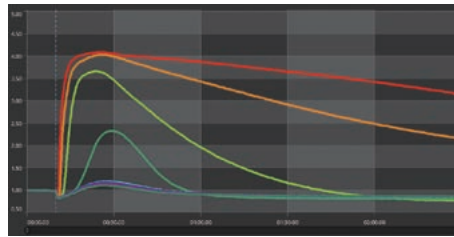
Cell: CHO cell
Dye: Fluo-8 AM (AAT Bioquest)
Compound: ATP final 100 μM – 1 nM



Evaluation of ATP dose response using CHO cells: 384 format

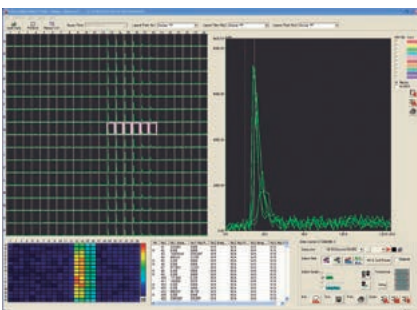


Cell: CHO 4000 cells/well
Dye: Calcium Kit iCellux (Dojindo Laboratories)
Compound: ATP final 10 μM – 10 pM



Aequorin assay

Intracellular Ca^{2+} assay by luminescence using an aequorin-expressing cell line

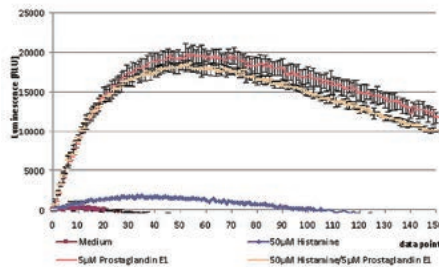


- Cell: Aeg-CHO (8000 cells/well)
- Substrate: coelenterazine
- Ligand: ATP (500 nM, 100 nM, 20 nM)

Measurements that are not affected by autofluorescence of the compound to be dispensed are enabled by using luminescence. Moreover, measurements with excellent S/N can be performed.

cAMP assay

Analysis of time course of cAMP using HUVEC expressing GloSensor (Promega)

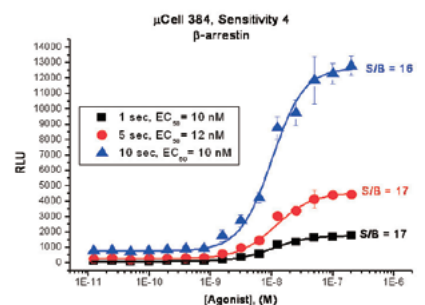


Measurement for 25 minutes at 10 second intervals after adding Histamine and Prostaglandine.

- Cell: HUVEC
- KIT: GloSensor

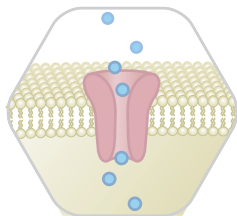
β -arrestin assay

Evaluation of β -arrestin internalization by compounds, using cells expressing PathHunter eXpress β -arrestin (DiscoverX)



Verification of S/B at exposure times of 10 seconds, 5 seconds, 1 second

- Cell: Harvest Cells
- KIT: PathHunter eXpress β -arrestin

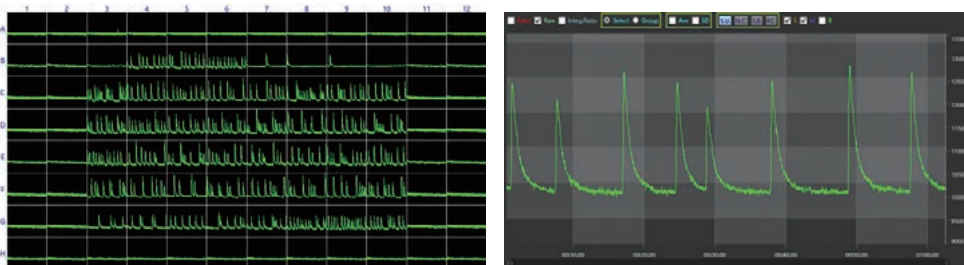


2. Ion channel

Ion channel screening can be performed using intracellular ion fluorescence indicators.

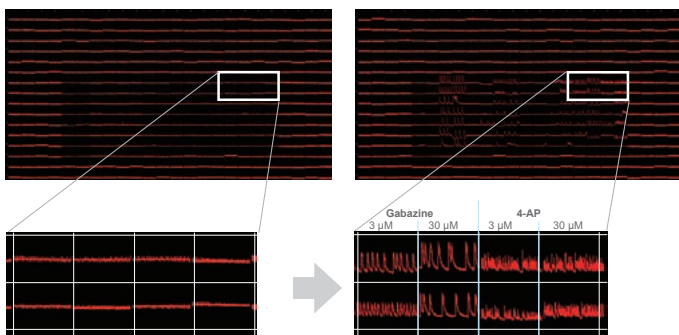
Ca²⁺ channel assay

Measurement of Ca²⁺ oscillation using primary neurons



- Cell: Primary neuron (Rat embryonic day 17, cerebral cortex) (Rat Cortex Neuronal Cell, Wako Pure Chemical Industries)
- Dye: Cal-520 AM
- FDSS: FDSS/ μ CELL
ImagEM 1x1 binning
exposure time 31 ms,
Interval 31 ms, +37 °C

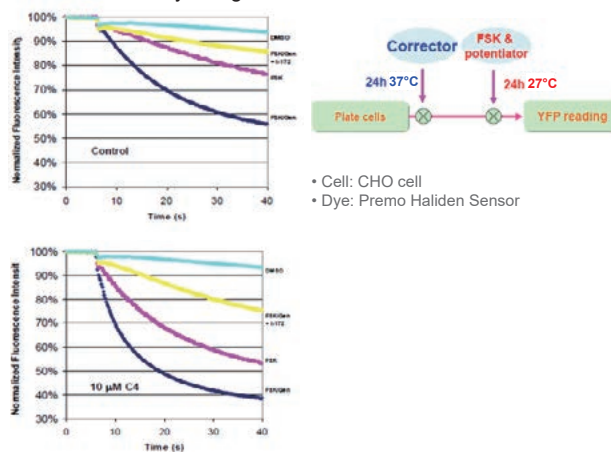
Evaluation of Ca²⁺ oscillation using primary neurons



- Before compound addition
17031011 G17-H20 Ratio 0.-8-1.5 Time 1 min
- 10 min after compound addition
17031013 G17-H20 Ratio 0.-8-1.5 Time 1 min
- Cells: • Hippocampus from Rat (embryonic day 19)
(#085-10301, Wako Pure Chemical Industries, Lot LKE0386)
• 2.0x10⁴ cells/well
• Poly-D-Lysin coating 384 well microplate
- Calcium probe:
• Cal-520AM (AAT bioquest) final 2 μ M
- FDSS/ μ CELL:
• ImagEM 2x2 binning
• exposure time/Sampling rate 31 ms

Cl⁻ channel assay

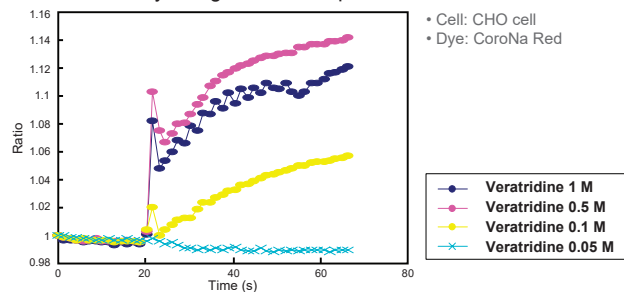
Cl⁻ channel assay using YFP



- Cell: CHO cell
- Dye: Premo Haliden Sensor

Na⁺ channel assay

Na⁺ channel assay using fluorescent probe

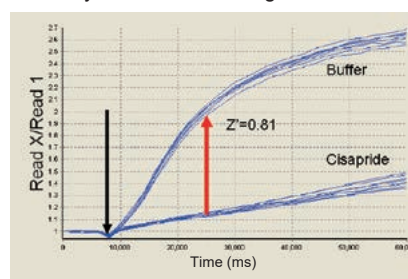


- Cell: CHO cell
- Dye: CoroNa Red

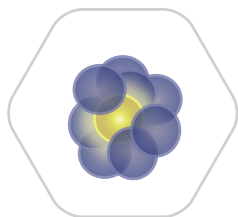
	CoroNa Red	Sodium Green
MW	773.32	1543
Molecular Probe Cat	C-24430	S-6901
Kd(K+free)	~200 nM	6 nM
Kd(K+Sat)	~200 nM	21 nM
Excitation wavelength	540 nm	480 nm
Emission wavelength	590 nm	540 nm

K⁺ channel assay

K⁺ assay in CHO cells using Flux-OR



- Cell: CHO cell
- Dye: Flux-OR Potassium

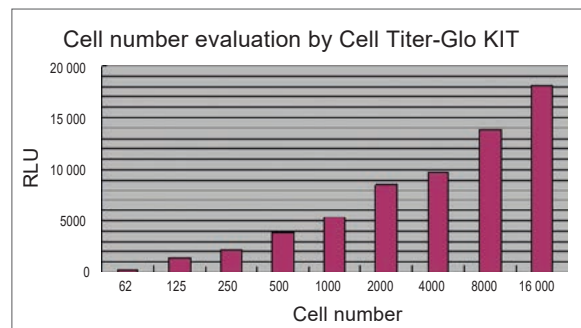


3. Luminescence

Luminescence screening can be performed using luminescent probes such as luciferase or aequorin.

Luciferase assay

Cell number evaluation using luciferase luminescence



- Cell: CHO-K1(16 000, 8000, 4000, 2000, 1000, 500, 250, 125, 62 cells/well)
- Kit: Cell Titer - Glo (Promega)

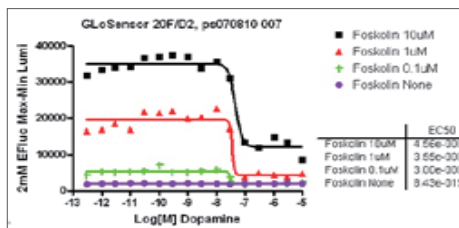
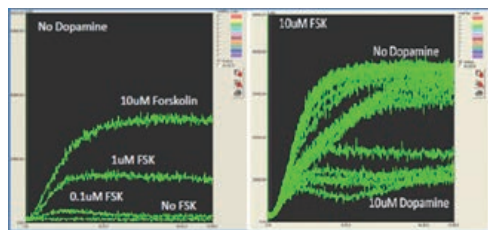


(cell number) 62 125 250 500 1k 2k 4k 8k 16k

It has high linearity and high sensitivity that can detect luminescence even with a small number of cells.

cAMP assay

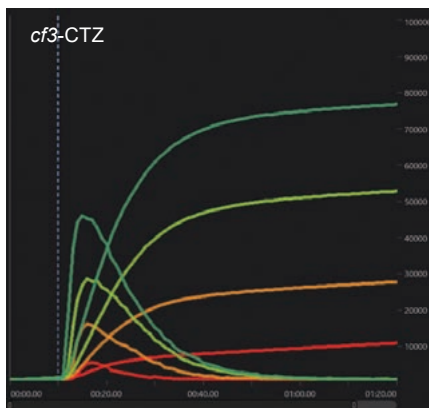
cAMP evaluation using GloSensor



- Cell: CHO cell
- Kit: GloSensor

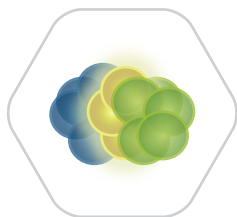
Aequorin assay

Ca²⁺ assay using aequorin-expressing cells



Cell: CHO-K1 stably expressing apoaequorin with a mitochondrial targeting signal
 Substrate: h-coelenterazine (*h*-CTZ), *cf3*-coelenterazine (*cf3*-CTZ)
 Compound: acetylcholine final 30 nM – 1 μM

S. Inoue, R. Iimori, Y. Sahara, S. Hisada, T. Hosoya, Application of new semisynthetic aequorins with long half-decay time of luminescence to G-protein-coupled receptor assay, Analytical biochemistry 407.2 (2010) 247-252.



4. BRET/FRET

Screening of protein-protein interaction can be performed using fluorescence/luminescence energy transfer.

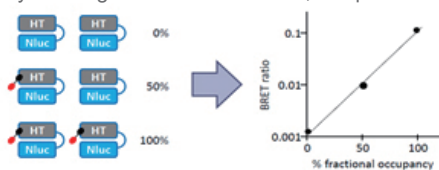
BRET assay

Control protein evaluation using NanoBRET

NanoBRET control protein calibration panel

- A control protein in which a HaloTag NanoBRET ligand is bound to a NanoLuc-HaloTag fusion protein
- Five types of controls with different ligand binding rates

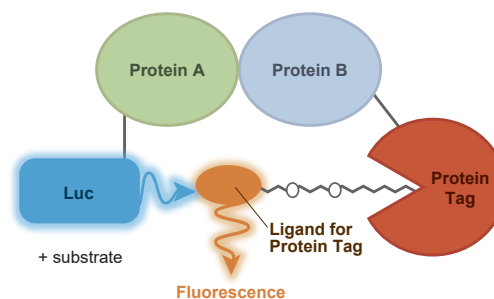
By drawing the calibration curve, it is possible to check how much the coupling rate can be detected



NanoBRET™ Control protein panel

— 5 vials representing the following amounts of fractional occupancy:

- NanoBRET™ Control Protein 1: 0 % NL-HT NanoBRET fractional occupancy
- NanoBRET™ Control Protein 2: 0.1 % NL-HT NanoBRET fractional occupancy
- NanoBRET™ Control Protein 3: 1 % NL-HT NanoBRET fractional occupancy
- NanoBRET™ Control Protein 4: 10 % NL-HT NanoBRET fractional occupancy
- NanoBRET™ Control Protein 5: 100 % NL-HT NanoBRET fractional occupancy



BRET assay using CHO cells

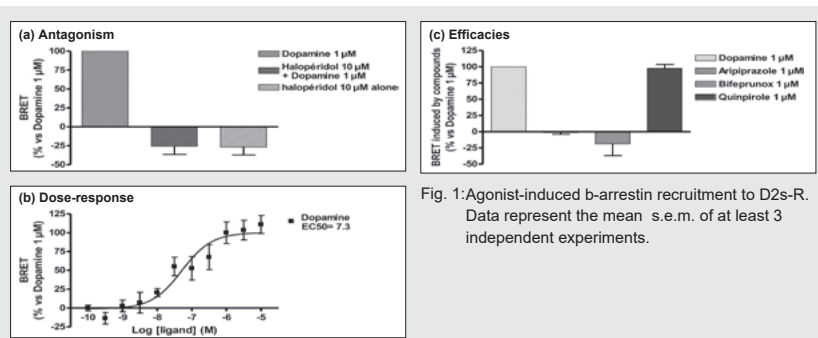
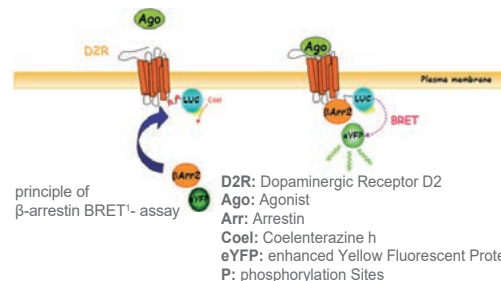


Fig. 1: Agonist-induced β -arrestin recruitment to D2s-R. Data represent the mean s.e.m. of at least 3 independent experiments.

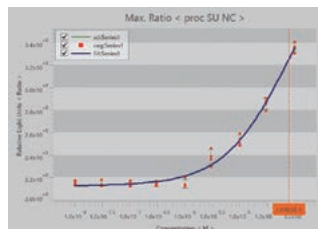
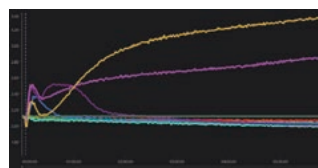
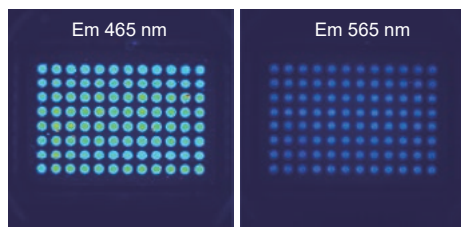


Data courtesy: Frederic Finana
Biologie Cellulaire et Moléculaire, Centre de Recherche Pierre Fabre
Finana F, De Vries L, Raully-Lestienne I et al. 10th European Functional Drug Screening Symposium Poster No. 8 (2014)

Rluc - D2s receptors and eYFP - β -arrestin 2 are expressed in CHO cells, and Rluc and eYFP BRET occurring in cells when Ligand is added are detected.

FRET assay

Evaluation of Nav 1.5-CHO cells using FRET-type voltage sensitive dye (VSP)



- Cell: Nav1.5-CHO cells (Ion Chat Research Corporation)
- Dye: Donor: CC2-DMPE (Invitrogen) final 5 μ M
Acceptor: DISBAC4(3) (Invitrogen) final 10 μ M
- Compound: Veratridine (Sigma)
final 100 μ M – 10 nM



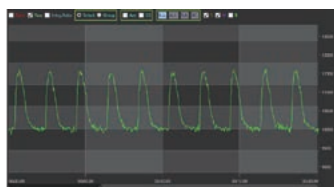
5. iPS-cell

Toxicity evaluation and drug discovery screening using iPS cell-derived cardiomyocytes and neurons can be performed.

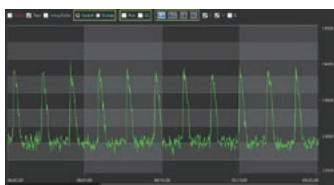
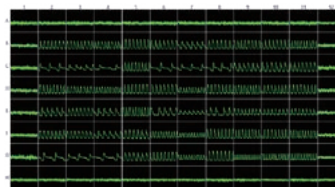
Ca²⁺ transient and membrane potential measurement using iPS cell-derived cardiomyocytes

	1	2	3	4	5	6	7	8	9	10	11	12
A												
B		Apremilast 0.1µM	Apremilast 0.1µM	Apremilast 0.1µM	DMSO 0.2µM	E-4031 0.1µM	E-4031 0.1µM	E-4031 0.1µM	Quinidine 1µM	Quinidine 1µM	Quinidine 1µM	
C		Apremilast 1µM	Apremilast 1µM	Apremilast 1µM	DMSO 0.2µM	E-4031 1µM	E-4031 1µM	E-4031 1µM	Quinidine 10µM	Quinidine 10µM	Quinidine 10µM	
D		*Cisapride 0.3µM	*Cisapride 0.3µM	*Cisapride 0.3µM	DMSO 0.2µM	Flecainide 1µM	Flecainide 1µM	Flecainide 1µM	*Terfenadine 1µM	*Terfenadine 1µM	*Terfenadine 1µM	
E		*Cisapride 3µM	*Cisapride 3µM	*Cisapride 3µM	DMSO 0.2µM	Flecainide 10µM	Flecainide 10µM	Flecainide 10µM	*Terfenadine 10µM	*Terfenadine 10µM	*Terfenadine 10µM	
F		Dofetilide 0.1µM	Dofetilide 0.1µM	Dofetilide 0.1µM	E-4031-Final 100nM	Moxifloxacin 30µM	Moxifloxacin 30µM	Moxifloxacin 30µM	Verapamil 0.1µM	Verapamil 0.1µM	Verapamil 0.1µM	
G		Dofetilide 1µM	Dofetilide 1µM	Dofetilide 1µM	E-4031-Final 300nM	Moxifloxacin 300µM	Moxifloxacin 300µM	Moxifloxacin 300µM	Verapamil 1µM	Verapamil 1µM	Verapamil 1µM	
H												

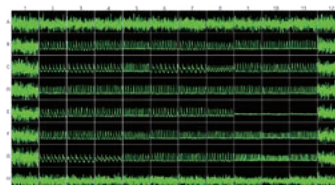
- Cell: iCell Cardiomyocytes² (CDI)
- Dye: Cal-520AM
- Plate format for various compounds



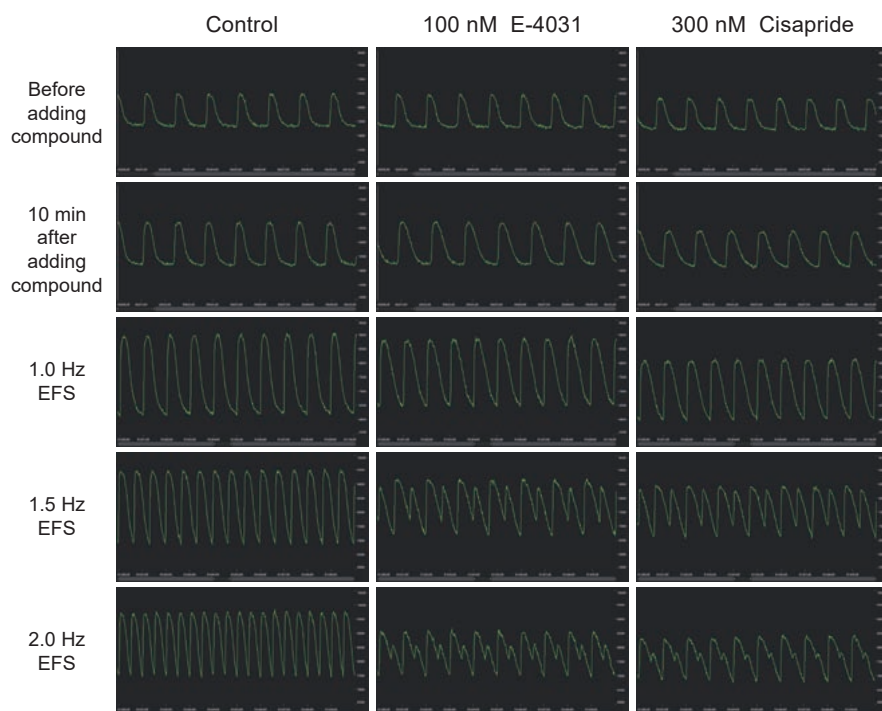
- Cell: iCell Cardiomyocytes² (CDI)
- Dye: Cal-520AM
- Ca²⁺ transient after addition of various compounds



- Cell: iCell Cardiomyocytes² (CDI)
- Dye: FluoVolt
- Action potential after addition of various compounds

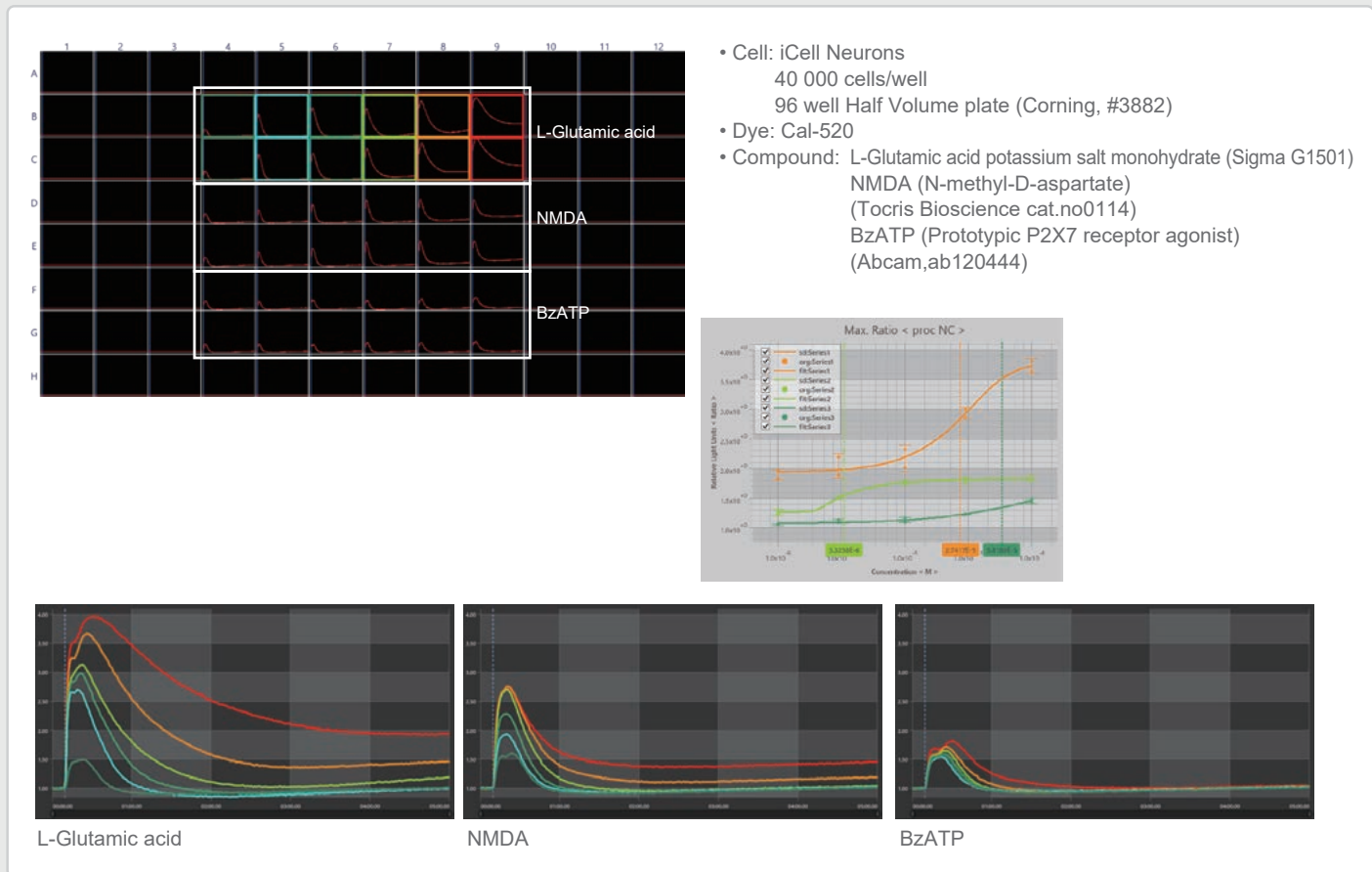


Ca²⁺ transient measurement <EFS (Electric Field Stimulation) pacing evaluation after drug addition>

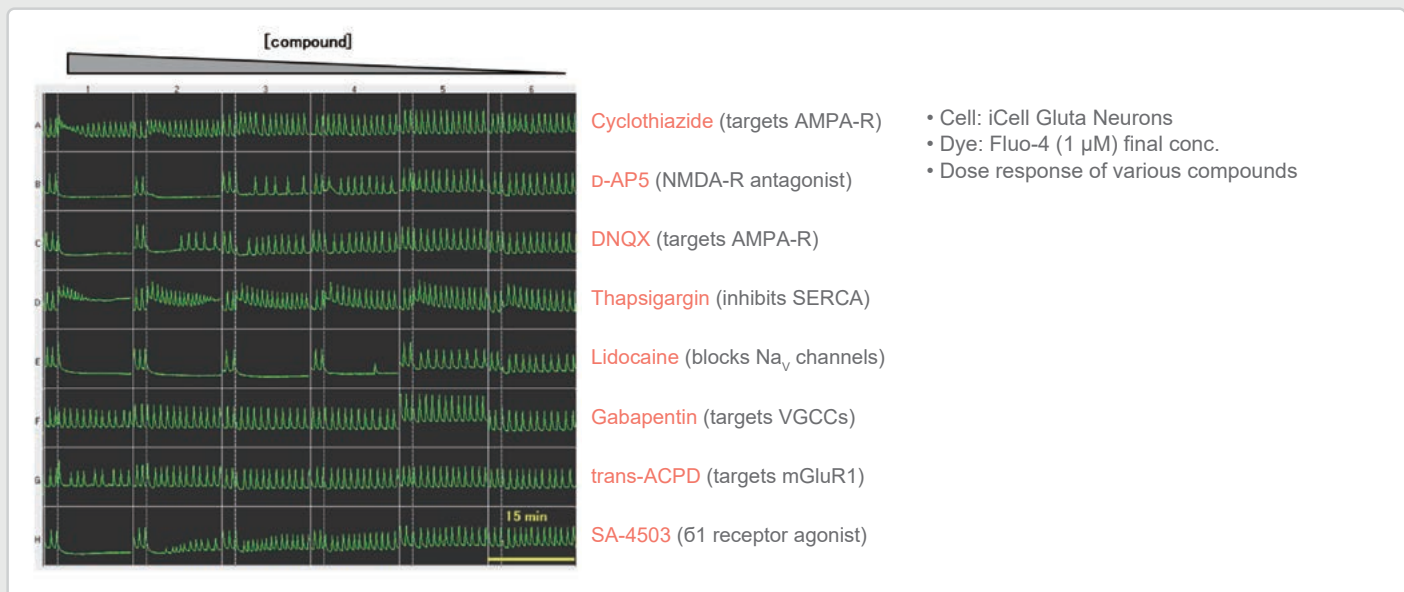


- Cell: Cardiomyocytes
- Dye: Cal-520
- EFS: voltage 5 V, pulse duration 10 ms, Height 0.0 mm, frequency 1 Hz – 2 Hz

Drug evaluation using iPS cell-derived neurons



Evaluation of efficacy of Ca²⁺ oscillation using iPS cell-derived Dopa-Neuron



Components

are the products must be ordered together and unable to separately order.

Product	Model	Content
Basic configuration		
FDSS/μCELL Main unit	A11529-01B	Main unit of FDSS/μCELL system. Robot connection upgrade is possible.
Dispenser tip installer	A11529-02	Device for collectively attaching and detaching dispensing tips. Install the tip rack on the bottom, place the dispenser head on the top, and manually release.
Compound plate stage	A11529-04B	Transporting stage capable of holding two reagent plates attached to the dispenser inside the main body. Controlled by software through the dispenser.
Washing stage	A11529-05B	Optional tip washing function and wiping table added to body. Automatically controlled by the main body and performs tip washing and wiping.
Heater unit	A11529-15	Heater is compatible with robot automation. Install inside the main body to keep it at +35 °C to +37 °C. ON/OFF and temperature setting on are the operation panel.
Fluorescence optical unit	M11031-02	Consists of an optical system for fluorescence measurement and controller for LED light source; the LED can be exchanged by the user.
Light source array unit (B,G)	L11601-06	LED light source for blue and green excitation measurement, fluorescent filter. Excitation central wavelength: 470 nm and 530 nm, fluorescence central wavelength: 540 nm and 593 nm.
ImagEM X2 EM-CCD camera	C9100-23B	High sensitivity CCD camera with charge multiplication mechanism on the tip. Can handle fluorescence and luminescence measurement.
Frame grabber board kit with IEEE1394b Cable	M9982-14	An interface kit for controlling a digital camera of the IEEE 1394B standard.
C mount lens 25 mm F0.95	A6402	25 mm F0.95 C mount lens used as an imaging optical system for EM-CCD camera.
Data analysis unit	C7903-11	Data analyzer for FDSS/μCELL. For controlling camera and dispenser/light source. (Computer table is not included.)
FDSS Software online	U8524-01A	Software for controlling FDSS/μCELL and acquiring images from the camera (Ver. 3.0). 64 bit OS compatible.
FDSS Software offline	U8524-03A	Offline software. Used to display, analyze, and output data on devices other than FDSS/μCELL. 64 bit OS compatible.
Packing and Domestic Transportation	SY48-3002	Basic Packing and Transportation from the factory to the forwarder in Japan.

Dispenser heads/Wash <options>		
Dispensing unit (96 tip type)	A10118-24	Dispenser head for dispensing reagents simultaneously into a 96-well microplate. Dispensing volume 10 μL to 200 μL, dispensing accuracy within 3 % CV (when dispensing 10 μL).
Dispensing unit (384 tip type)	A10118-26	Dispenser head for dispensing reagents simultaneously into a 384-well microplate. Dispense volume 1 μL to 30 μL, dispensing accuracy within 5 % CV (when dispensing 5 μL).
Washing unit	A11529-09	Unit for washing tips attached to the dispenser head. Includes bath/tube/control pump/washing liquid tank/waste liquid tank.
Chimney plate (96 tip type)	A11529-12	Option for washing tips attached to dispenser head (96 chips) A10118-24. Used in combination with the washing unit.
Chimney plate (384 tip type)	A11529-13	Option for washing tips attached to dispenser head (384 chips) A10118-26. Used in combination with the washing unit.

Electric Field Stimulation (EFS) *1 <options>		
EFS pacing system	M13040-01	Option to give 96 multichannel electrical stimulation to cells. Pace cellular activity and evaluate the effect of drugs added to the cells.
Desktop ultrasonic bath for EFS pacing (US)	A14020-01	Desktop ultrasonic washer for washing the electrodes of EFS pacing head (96 ch) A13029-01.
Desktop ultrasonic bath for EFS pacing (EU)	A14020-01CR	Desktop ultrasonic washer for washing the electrodes of EFS pacing head (96 ch) A13029-01.
Washing attachment	A14236	Attachment for EFS pacing desktop ultrasonic cleaner A14020-01.
Vacuum wipe function	A14218	Wipe stage with vacuum capability to always have dried absorbance paper for wiping.

*1 The FDSS/μCELL EFS system should not be used for optically detecting/monitoring change in transmembrane potential of the cells.
The FDSS/μCELL EFS system should not be used on any cell or cells in which the user or anyone else has expressed target ion channels.

Optical system/Barcode reader <options>		
Fluorescence filter changer unit (US)	A8472-07	Change the emission wavelength by automatically changing the four emission filters installed in front of the camera. Built-in fluorescent filter wheel.
Fluorescence filter changer unit (EU)	A8472-07	Change the emission wavelength by automatically changing the four emission filters installed in front of the camera. Built-in fluorescent filter wheel.
CO2 incubator *2	A11529-16	Adds CO2 incubation function around the assay plate installed in FDSS/μCELL.
Barcode reader for assay plate	A11529-10	Option for reading the barcode attached to the assay plate. Reads the barcode on the right side of the assay plate on the stage.
Barcode reader for compound plate	A11529-11	Option for reading the barcode attached to the reagent plate. Reads the bar code on the right side of the reagent plate on the stage.

*2 Option to maintain the CO2 concentration around the assay plate at 5 % to 6 %. Cannot be combined with automatic door unit A11529-07 or automatic assay plate stage A11529-08.
When C11529-16 is added, the barcode reader may not function depending on the position of the barcode, due to the structure.

Sensor <options>		
ORCA-Flash4.0 V3 Digital CMOS camera	C13440-20CU	Fluorescence measurement camera. Equipped with CMOS image sensor for scientific measurement, it has high resolution of 4 million pixels and high-speed reading of 100 frames/sec.
Frame grabber board CameraLink for ORCA-Flash V3	M9982-29	Image input board compatible with Camera Link/Deca (80 bit).
Camera Link cable SDR-SDR 4 m *3	A14038-04	Cable of Camera Link interface standard. Cable length: 4 m.
C mount lens	A6402-01	50 mm F1.8 C mount lens. Used as an imaging optical system with ORCA-Flash4.0 V3.
Hose set without joint *4	A10788-04	Two hoses with a relay connector for connecting to a circulating water cooler.

*3 Two are required.

*4 Hose set is to be used with the water circulator chiller. Please enquire to your Hamamatsu Representative for the water circulator chiller for the digital camera.

Excitation light source <options>		
Light source array unit (Fluo-4)	L11601-01A	LED light source for Fluo-4 measurement, fluorescence filter. Excitation central wavelength: 470 nm, fluorescence central wavelength: 540 nm.
Light source array unit (FMP)	L11601-02A	LED light source for FMP measurement, fluorescence filter. Excitation central wavelength: 530 nm, fluorescence central wavelength: 593 nm.
Light source array unit (VSP-FRET)	L11601-03	LED light source for membrane potential measurement, fluorescence filter. Excitation central wavelength: 385 nm, fluorescence central wavelength: 465 nm and 565 nm.
Light source array unit (CFP/YFP-FRET)	L11601-04	C/Y LED light source for FRET, fluorescence filter. Excitation central wavelength: 450 nm, fluorescent central wavelength: 483 nm and 542 nm.

Automation *5 <options>		
Self-operating door unit	A11529-07	Option for adding automatic door control to main unit. It is automatically controlled by the main unit to open and close the door during assay plate stage operations.
Auto assay plate stage	A11529-08B	Option to add a stage to place assay plate in the main unit. It is automatically controlled by the main unit, enabling robotic access to the assay plate.
FDSS external control software	U8524-13A	Enables FDSS external control interface of FDSS software.

*5 A driver development fee separate from the above options is required to implement automation. (automation integrator)
Since we do not provide drivers for external control, we ask that you receive an estimate from an automation integrator.

Software <options>		
FDSS Software Offline	U8524-03A	Offline software. Used to display, analyze and output data on devices other than FDSS/μCELL. 64 bit OS compatible.
FDSS Software option High Speed Acquisition Option	U8524-11	Software module and protection key enabling high-speed capture. High-speed capture functions at 5 ms.
FDSS Software option Waveform Analysis software for cardiomyocyte	U8524-12	Software and protection key for multiwell analysis of waveforms obtained from cardiomyocytes.
FDSS Software option Export TIFF image option	U8524-14	Add function to save TIFF (16 bit) image from FDSS software.

Consumables		
96 black tip (10 racks) for FDSS7000/μCELL	A8687-32A	Mounted on dispenser head (96 ch tip type) A10118-24, tip for aspirating liquid from a designated container and dispensing it to a microplate.
384 black tip (10 racks) for FDSS7000/μCELL	A8687-62C *6	Mounted on dispenser head (384 ch tip type) A10118-26, tip for aspirating liquid from a designated container and dispensing it to a microplate.

*6 Alphabet in the suffix of the model number may vary. (Ex. A8687-62B)

Spare parts *7		
EFS pacing head (96ch)	A13029-01	96 multi-channel pacing head for replacement. Option for EFS pacing system M13040-01.
Dispensing unit (96 tip type)	A10118-24	Dispenser head for dispensing reagents simultaneously into a 96-well microplate. Dispensing volume 10 μL to 200 μL, dispensing accuracy within 5 % CV (when dispensing 10 μL).
Dispensing unit (384 tip type)	A10118-26	Dispenser head for dispensing reagents simultaneously into a 384-well microplate. Dispense volume 1 μL to 30 μL, dispensing accuracy within 5 % CV (when dispensing 5 μL).

*7 Dispenser unit performance (e.g. dispense uniformity, CV) is not covered under any warranty or guarantee offered from Hamamatsu representative and will gradually degrade as long as you use. Once exceeding the validation limit, dispenser head need to be replaced.

Maintenance and Validation service		
Maintenance for the hardware and quality check of the dispenser head need to be performed periodically to validate your instrument. We will announce about the maintenance service contract and validation service before the date of one year from the installation date, and we strongly recommend to have a full-service contract that covering the maintenance service and validation service, to certify the performance. Full-service contract is only available and possible to contract during the 1st year after installation. Please contact your Hamamatsu representative for further more information.		

Basic configuration



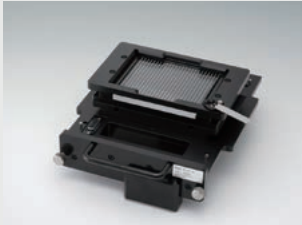
▲ ImagEM X2 EM-CCD camera C9100-23B



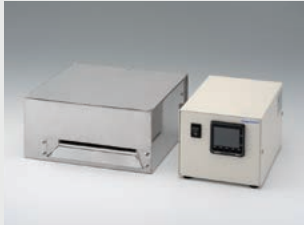
▲ Light source array unit (B,G) L11601-06



▲ Dispenser tip installer A11529-02



▲ Fluorescence optical unit M11031-02



▲ Heater unit A11529-15

Dispenser heads <options>



▲ Dispensing unit (96 tip type) A10118-24



▲ Dispensing unit (384 tip type) A10118-26

Electric Field Stimulation (EFS) <options>



▲ EFS pacing system M13040-01

Optical system <options>



▲ Fluorescence filter changer unit (US) A8472-07

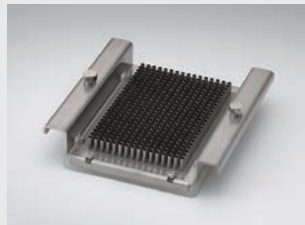
Wash <options>



▲ Washing unit A11529-09



▲ Chimney plate (96 tip type) A11529-12



▲ Chimney plate (384 tip type) A11529-13

Sensor <options>



▲ ORCA-Flash4.0 V3 Digital CMOS camera C13440-20CU

Consumables/Spares



▲ 96 black tip (10 racks) for FDSS7000/ μ CELL A8687-32A



▲ 384 black tip (10 racks) for FDSS/ μ CELL A8687-62A*
*Alphabet in the suffix of the model number may vary. (Ex. A8687-62B, -62C)



▲ EFS pacing head (96 ch) A13029-01

Appearance/Specifications

System appearance



Standard type

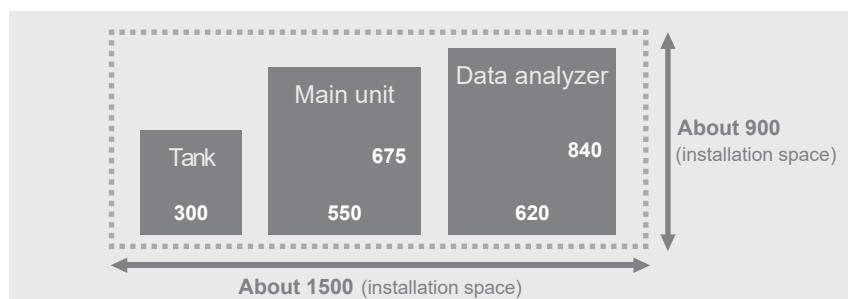


Robot connection type

* To support robotic connection, additional components such as automatic door unit A11529-07, automatic assay plate stage A11529-08B and external control software interface U8524-13 are required.
Retrofitting is not supported. For details please contact our sales department.
* Computer table is not included.

System footprint

Unit: mm

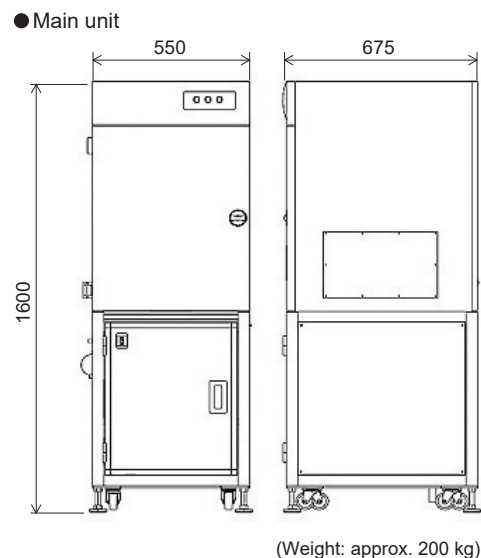


Specifications

Dispense	(96-tip type) A10118-24	10 μ L to 200 μ L
	(384-tip type) A10118-26	1 μ L to 30 μ L
Sensor (ImagEM)	High-speed, high-sensitivity digital EM-CCD camera for fluorescence and luminescence	
Sampling rate	10 Hz (10 data point per second)	
Sampling interval	200 Hz (200 data point per second) maximum with U8524-11 option	
	0.1 s to 100 s interval	
Light source (L11601-06)	0.005 s to 100 s interval with U8524-11 option	
	470 nm excitation and 540 nm emission	
Plate positions	530 nm excitation and 593 nm emission	
	One stage for assay plate, two stages for compound plate	
Adaptable microplate	Clear bottom black 96/384 plates (SBS format height 8 mm to 15 mm)	
Tip/Plate loading	Manual loading	
Number of sampling data point	1 to 50 000 sampling	
Power supply specification	Input power supply: AC 100 V to AC 240 V, Frequency: 50 Hz/60 Hz	
Power consumption when AC 100 V to AC 120 V (Data Analysis unit and FDSS/ μ CELL main unit with heater)	Approx. 1300 VA	
	(Data analysis unit: approx. 500 VA, dispenser main unit: approx. 300 VA, heater unit, approx. 500 VA)	
Power consumption when AC 200 V to AC 240 V (Data Analysis unit and FDSS/ μ CELL main unit with heater)	Approx. 1170 VA	
	(Data analysis unit: approx. 500 VA, dispenser main unit: approx. 300 VA, heater unit, approx. 370 VA)	
Ambient operating temperature	+15 $^{\circ}$ C to +30 $^{\circ}$ C	
Dimension/weight	Main unit (Data analysis unit is not included) 550 mm (W) \times 675 mm (D) \times 1600 mm (H)/approx. 200 kg	

Dimensional Outlines

Unit: mm



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