

# Cytek Aurora™ System

Say Hello to a New Reality

## Meet Cytek Aurora™ System:



A prodigy incorporating a unique combination of innovative technologies that takes flow cytometry to the next level of performance and flexibility.

With up to five lasers, three scattering channels, and 64 fluorescence channels, the Cytek Aurora™ system suits every laboratory's needs, from simple to high-complexity applications. A paradigm shifting optical design provides unprecedented flexibility, enabling the use of a wide array of new fluorochrome combinations without reconfiguring your system for each application. The state-of-the-art optics and low-noise electronics provide excellent sensitivity and resolution. Flat-top laser beam profiles, combined with a uniquely designed fluidics system, translate to outstanding performance at high sample flow rates.

**The end result is a system that delivers high quality data where rare and dim populations are easily resolved, regardless of assay complexity.**

SpectroFlo® software offers an intuitive workflow from quality control to data analysis with technology-enabling tools that simplify running any application.

The Cytek team has reimagined every aspect of cytometry hardware and software to deliver an instrument that fulfills scientists' needs.



### ➤ So Many Channels

**64 fluorescence channels** of detection over the full emission spectra.

### ➤ So Many Colors

**40 colors** demonstrated including fluorochromes with emission spectra in close proximity to each other.

### ➤ Exceptional Sensitivity

**Sensitivity redefined** using state-of-the-art optics and low-noise electronics.

### ➤ Excellent Flexibility

**No need to reconfigure optical filters** for different fluorochromes.

**Use any commercially available fluorochrome** excited by the onboard lasers.

### ➤ A New Level of Accessibility

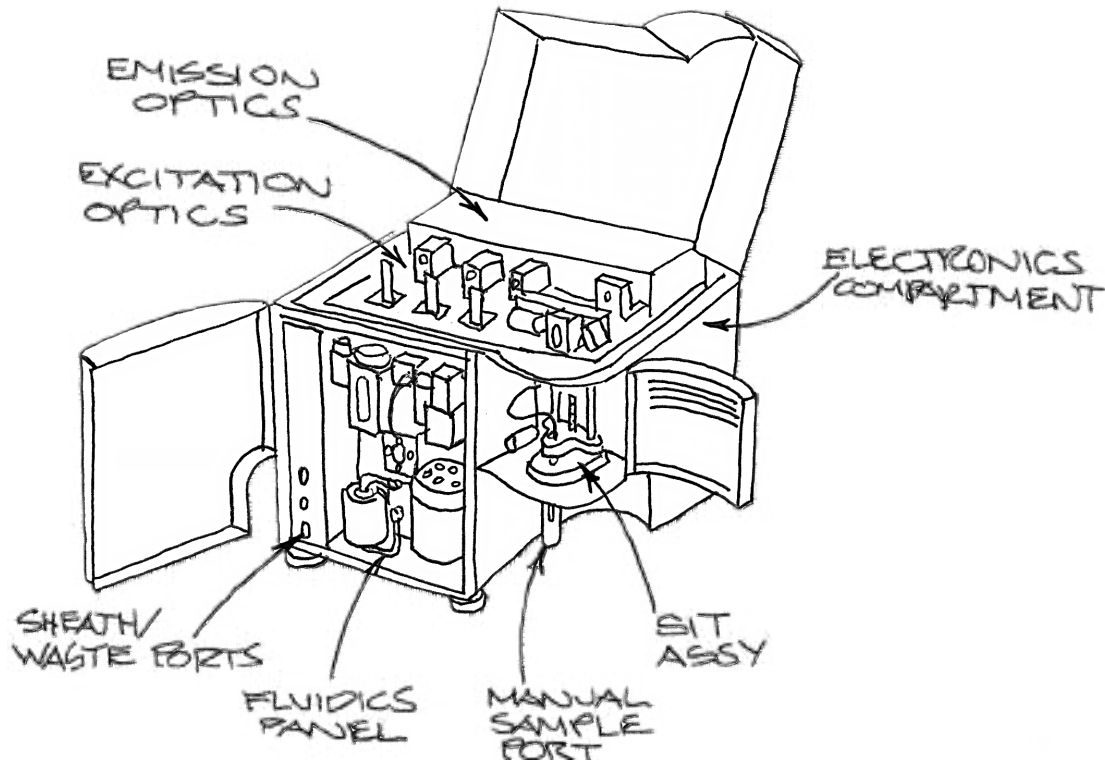
**A powerful, high value system** that is accessible to a wide range of users.

# The Cytek Aurora™ System's Revolutionary Technologies:

## From Vision to Reality

**The Aurora system is capable of up to 67 detection channels (64 fluorescence channels, FSC, blue laser SSC, and violet laser SSC) and is empowered by revolutionary technologies, including:**

- Proprietary high sensitivity Coarse Wavelength Division Multiplexing (CWDM) semiconductor detector arrays, enabling more efficient spectrum capture for dyes emitting in the 365-829 nm range.
- High bandwidth electronics design scalable up to 67 channels.
- Robust vacuum fluidics system enables ultimate flexibility in sample input formats.
- Exceptional small particle detection is enabled by violet laser scatter, narrow beam height, and proprietary flat top laser design.



# Resolving Challenging Dye Combinations

The detection of some fluorochrome combinations by conventional flow cytometry presents a challenge due to high amounts of spectral overlap (Figure 1, 4). The Cytek Aurora™ system addresses this challenge by using differences in full emission spectra signatures across all lasers to clearly resolve these combinations, even if the populations are co-expressed (Figures 2, 3, 5, and 6).

## Example 1: APC and Alexa Fluor 647



Figure 1: Spectrum plots from a conventional spectrum viewer shows heavy overlap between APC and Alexa Fluor 647.

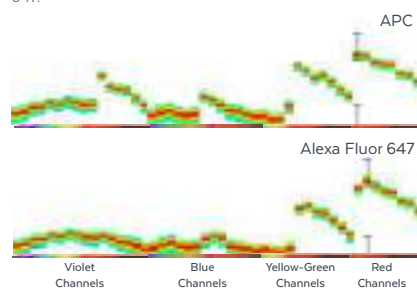


Figure 2: Spectrum plots from a four-laser Cytek Aurora™ system show distinct signatures for APC and Alexa Fluor 647.

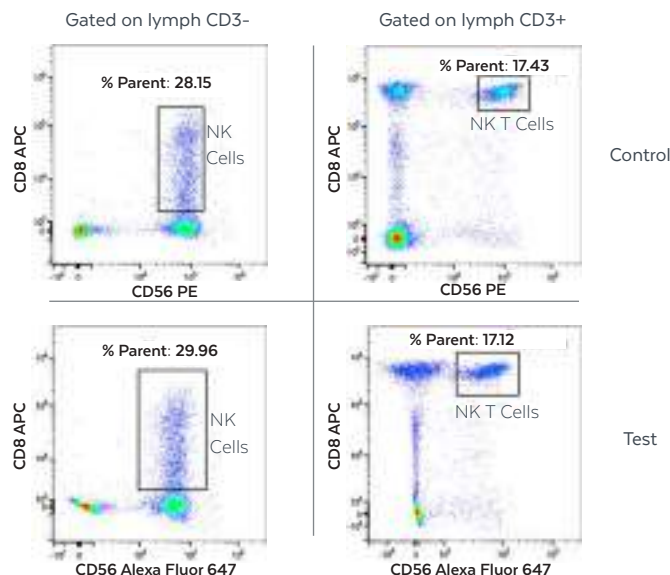


Figure 3: Whole blood from a healthy donor was stained, lysed, washed, and analyzed on a four-laser Cytek Aurora™ system. Subsets of NK and NK T cells that co-express CD56 Alexa Fluor 647 and CD8 APC were easily identified. For comparison, blood from the same donor was stained with CD56 PE and CD8 APC and yielded similar percentages of NK and NK T cells, demonstrating that APC and Alexa Fluor 647 combined did not impact results.

## Example 2: BFP, GFP, and mCherry

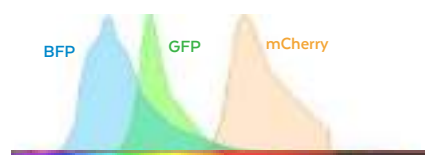


Figure 4: Spectrum plots from a conventional spectrum viewer.

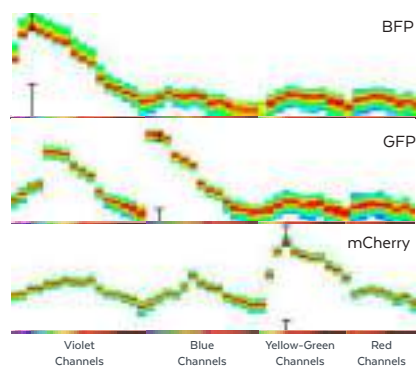


Figure 5: Spectrum plots from a four-laser Cytek Aurora™ system show distinct signatures for BFP, GFP and mCherry.

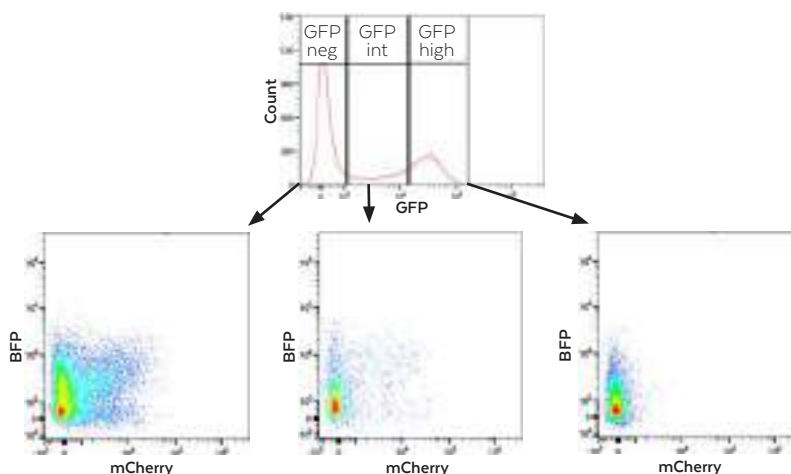


Figure 6: AB2.2 mouse embryonic stem cells were genetically modified to stably express BFP, GFP and mCherry under the control of different fate marker promoters. The stable cell line generated was then cultured under differentiation conditions, harvested, and analyzed on a four-laser Cytek Aurora™ system to assess the expression of fluorescent proteins. Autofluorescence extraction was used to enhance results. Sample courtesy from Luigi Russo, Hannah L. Sladitschek and Pierre Neveu, Cell Biology & Biophysics, Neveu group, EMBL.

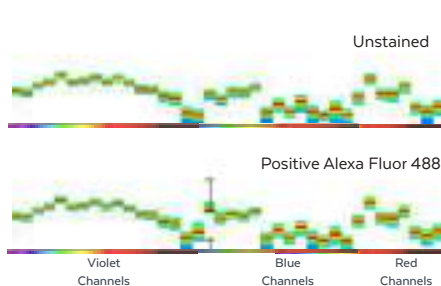


# See More Clearly with Autofluorescence Extraction

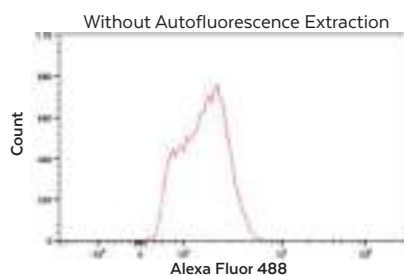
The Cytek Aurora™ system's implementation of full spectrum cytometry enables the use of autofluorescence extraction to further improve data clarity. Certain sample types, such as yeast and tumor samples, present the challenge of high autofluorescence. For these challenging applications involving highly autofluorescent particles, let the software's autofluorescence extraction tool bring new levels of resolution.

## Example 1: PrimeFlow™ RNA Assay

Human U937 cells were subjected to the PrimeFlow™ RNA Assay. The cells underwent a series of hybridization steps to label mRNA for HMBS, a low expressed gene (~10 copies/cell), with Alexa Fluor® 488. The sample was run on the Cytek Aurora™ system and analyzed using SpectroFlo® software with two different strategies, one with autofluorescence extraction and one without.

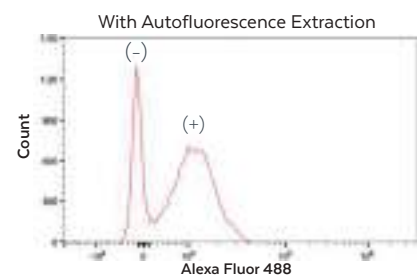


Spectrum plots of unstained and Alexa Fluor 488 stained cells acquired on the Aurora system. Note that the two spectra heavily overlap.



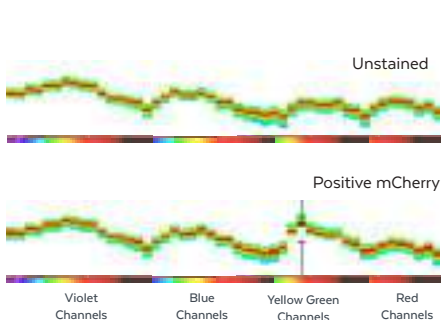
Due to high autofluorescence, separation of negative and positive signals was marginal (left histogram). Autofluorescence extraction greatly improved the resolution of the two cell populations (right histogram).

PrimeFlow™ is a trademark of Thermo Fisher Scientific

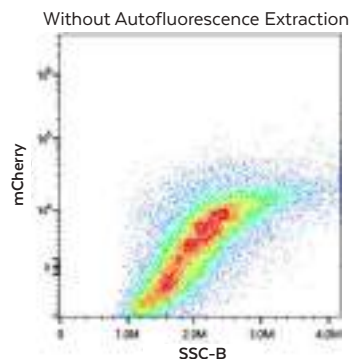


## Example 2: mCherry Expressing HeLa Cells

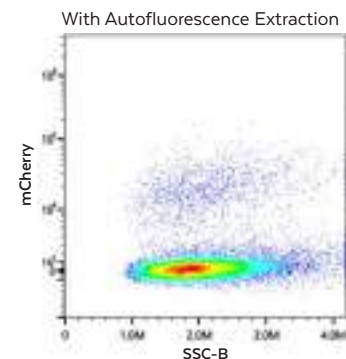
HeLa human cells were transformed with a CRISPR-Cas9 target vector carrying an mCherry reporter. Expression of mCherry is driven by the endogenous promoter of the knocked-in gene. The cells were harvested 32 hour post-infection and analyzed on a four-laser Aurora system to assess integration of the fluorescent protein. Autofluorescence extraction was used to enhance the resolution. Sample courtesy of Malte Paulsen, Flow Cytometry and Cell Sorting Facility, EMBL.



Spectrum plots of unstained and positive mCherry cells acquired on the Cytek Aurora™ system. Note that the two spectra heavily overlap.



Due to high sample autofluorescence, negative and positive cell populations were nearly indistinguishable (left plot). Autofluorescence extraction greatly improved the resolution of the two cell populations (right plot).



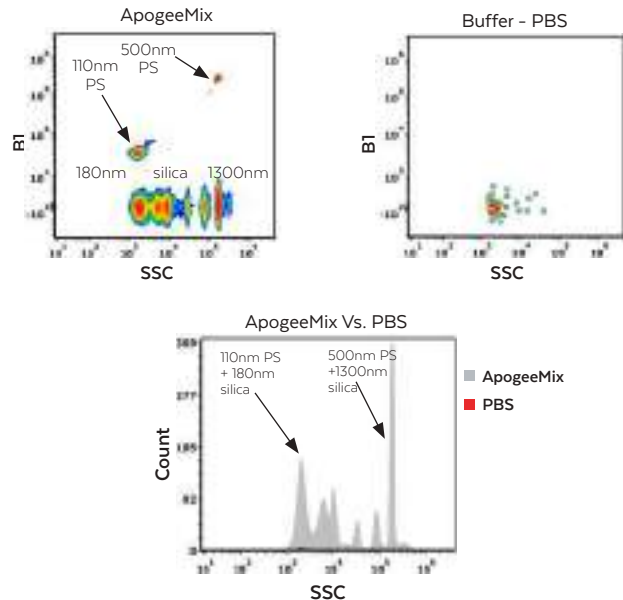
## Small Particles in Full View

With its onboard 100 mW 405 nm laser and highly sensitive violet SSC detector, particles nearing 100 nm in size can be analyzed. The Cytek Aurora™ system opens the door to a wide variety of small particle applications, taking what was once hidden and placing it in full view.

### Example 1: ApogeeMix

Resolution of ApogeeMix from Apogee Flow Systems ([www.apogeeflow.com](http://www.apogeeflow.com)), a mixture of silica and polystyrene (PS) beads ranging from 110 nm to 1300 nm, when acquired on the Aurora system. The smallest particles can be easily identified above background.

Data analyzed using FCS Express™ 6 by De Novo™ Software.



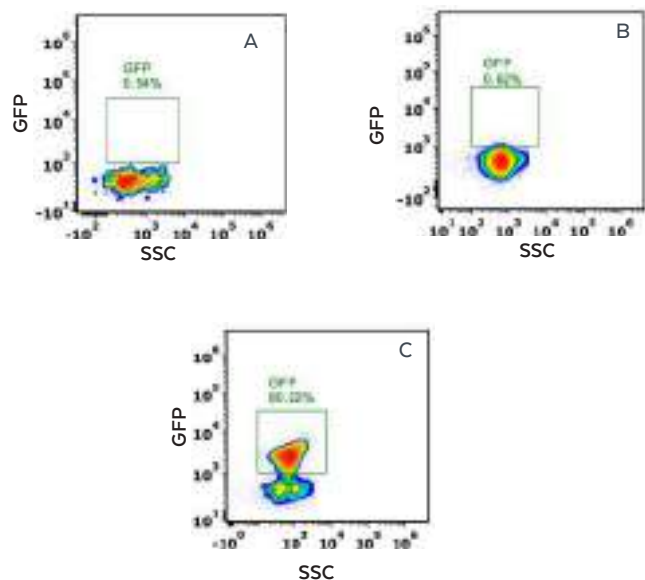
### Example 2: ViroFlow

Murine Leukemia Virus (MLV-124 nm ±14 nm) genetically engineered to express superfolder GFP (sfGFP) as a fusion protein with the viral envelope glycoprotein.

The plots on the right show:

- A) Buffer only
- B) MLV with no sfGFP (MV-M-Zero)
- C) MLV with sfGFP-Env (MV-M-sfGFP)

All samples were run on a three-laser Aurora system using violet SSC as a threshold trigger. Virus reference particles were provided by ViroFlow Technologies ([www.viroflowtechnologies.com](http://www.viroflowtechnologies.com)).



Data analyzed using FCS Express™ 6 by De Novo™ Software.

## More Choice, Greater Flexibility, Easier Setup

The optical design combined with the unmixing capability in SpectroFlo® software allows greater fluorochrome choice, panel flexibility, and easy setup without having to change filters. The three-laser configuration provides outstanding multi-parametric data for a wide array of applications. Markers and fluorochromes in a 24-color panel designed for identification of circulating cell subsets in human peripheral blood are summarized in the table below:

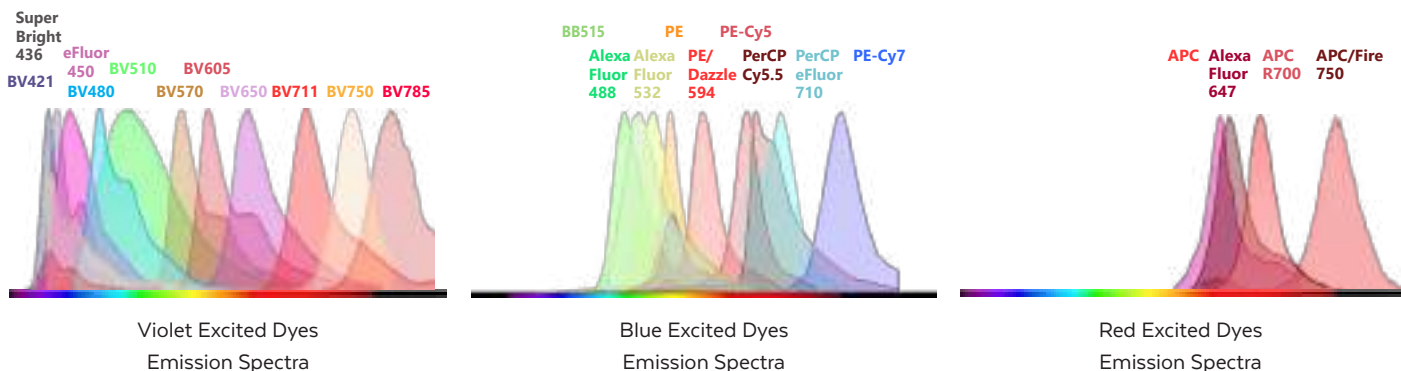
SPECIFICITY	FLUOROCHROME	SPECIFICITY	FLUOROCHROME	SPECIFICITY	FLUOROCHROME
CCR7	Brilliant Violet 421™	CD11c	BD Horizon™ BB515	CD27	APC
CD19	Super Bright 436	CD45RA	Alexa Fluor® 488	CD123	Alexa Fluor® 647
CD16	eFluor® 450	CD3	Alexa Fluor® 532	CD127	BD Horizon™ APC R700
TCR γδ	BD Horizon™ BV480	CD25	PE	HLA DR	APC/Fire™ 750
CD14	Brilliant Violet 510™	IgD	PE/Dazzle™ 594		
CD8	Brilliant Violet 570™	CD95	PE-Cy™5		
CD1c	Brilliant Violet 605™	CD11b	PerCP-Cy™5.5		
PD-1	Brilliant Violet 650™	CD38	PerCP-eFluor® 710		
CD56	Brilliant Violet 711™	CD57	PE-Cy™7		
CD4	Brilliant Violet 750™				
CD28	Brilliant Violet 785™				

### 24-COLOR DATA



On the next page, this 24-color panel is demonstrated in a healthy donor using a whole blood lyse wash sample preparation.

## The 24-Color Panel Includes Many Highly Overlapping Dyes:

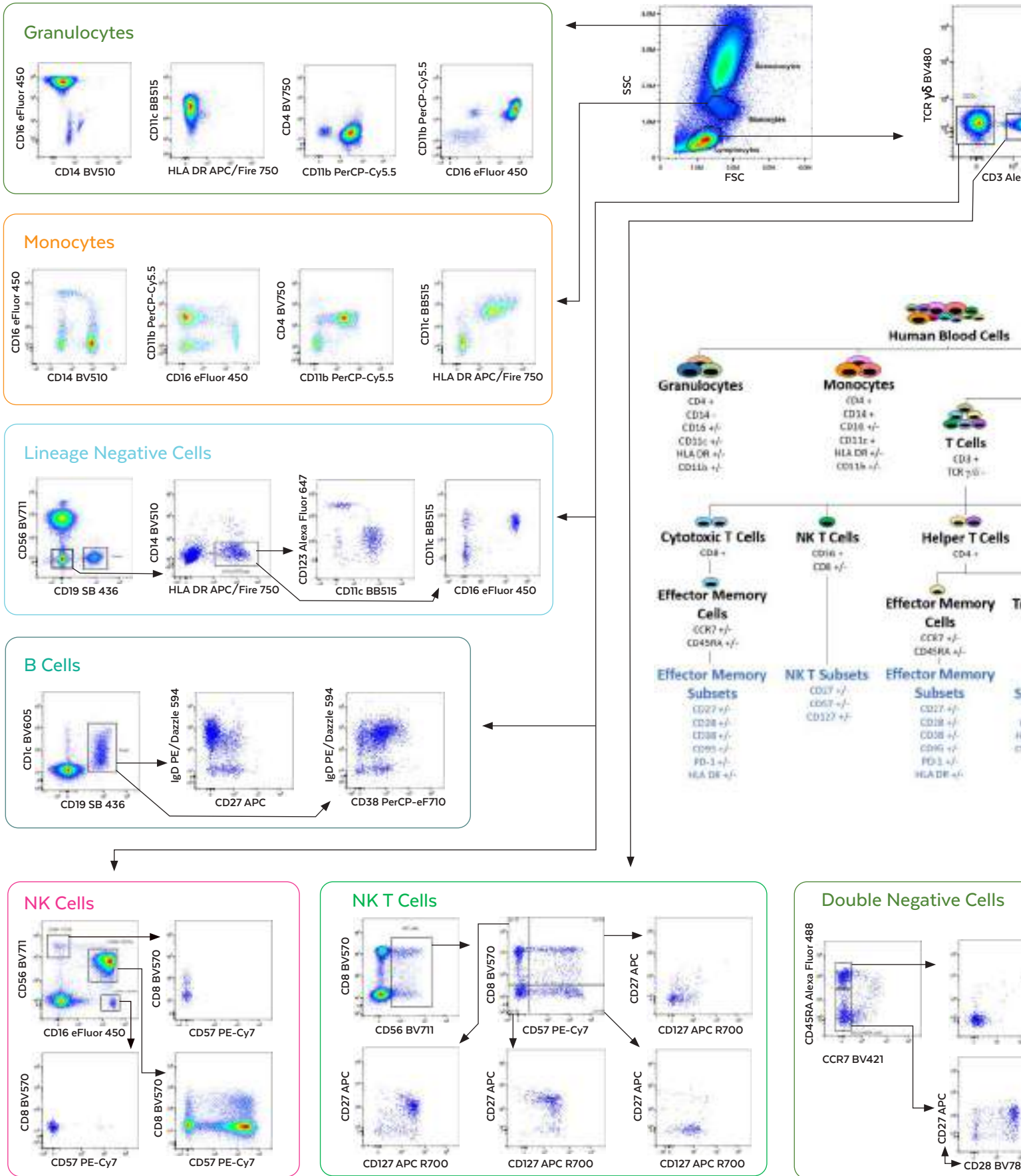


APC/Fire™ and PE/Dazzle™ are the trademarks and property of BioLegend, Inc.  
Brilliant Violet™ is a trademark of Sirigen Group Ltd.  
BD Horizon™ and Brilliant Blue (BB) are trademarks of BD Biosciences.  
Alexa Fluor®, eFluor®, and Super Bright are trademarks of Thermo Fisher Scientific.  
Cy® and CyDye® are registered trademarks of GE Healthcare

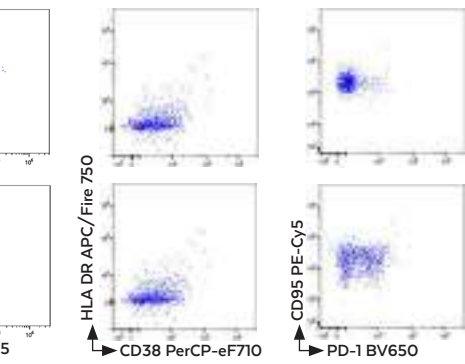
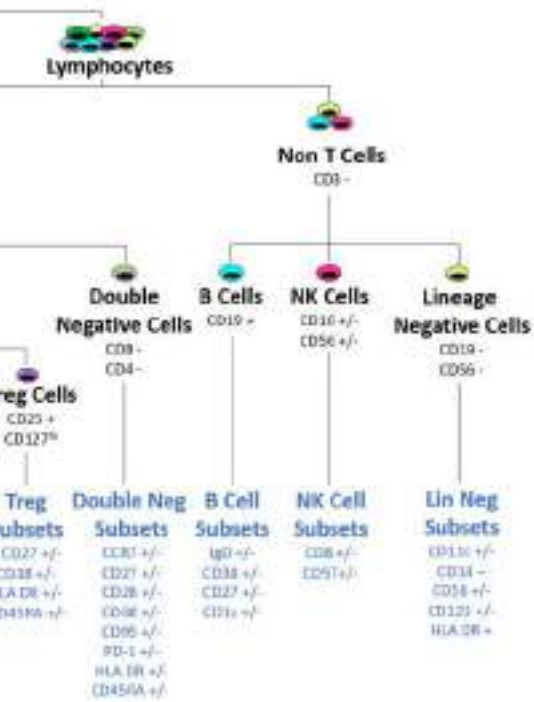
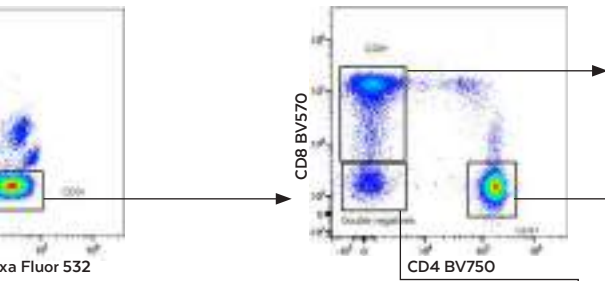
Allophycocyanin (APC) conjugates: US Patent No. 5,714,386  
PE-Cy7: US Patent Number 4,542,104.  
APC-Cy7: US Patent Number 5,714,386.  
Trademarks are the property of their respective owners.

# A New Reality:

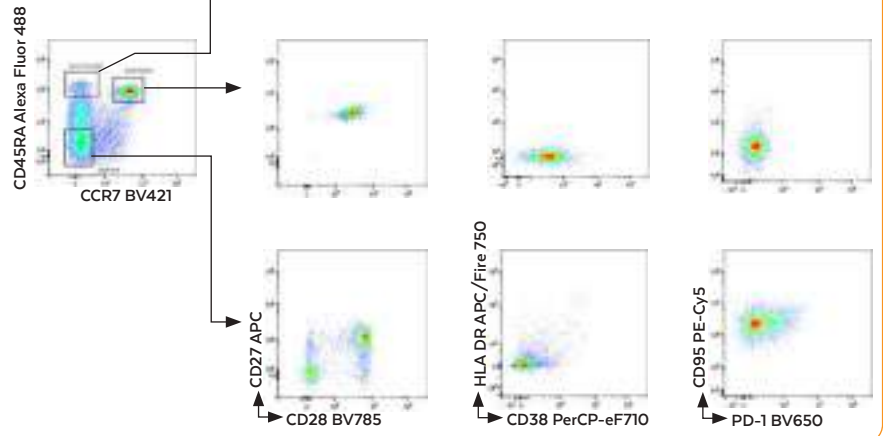
## 3 Lasers, 24 Colors, Unparalleled Resolution



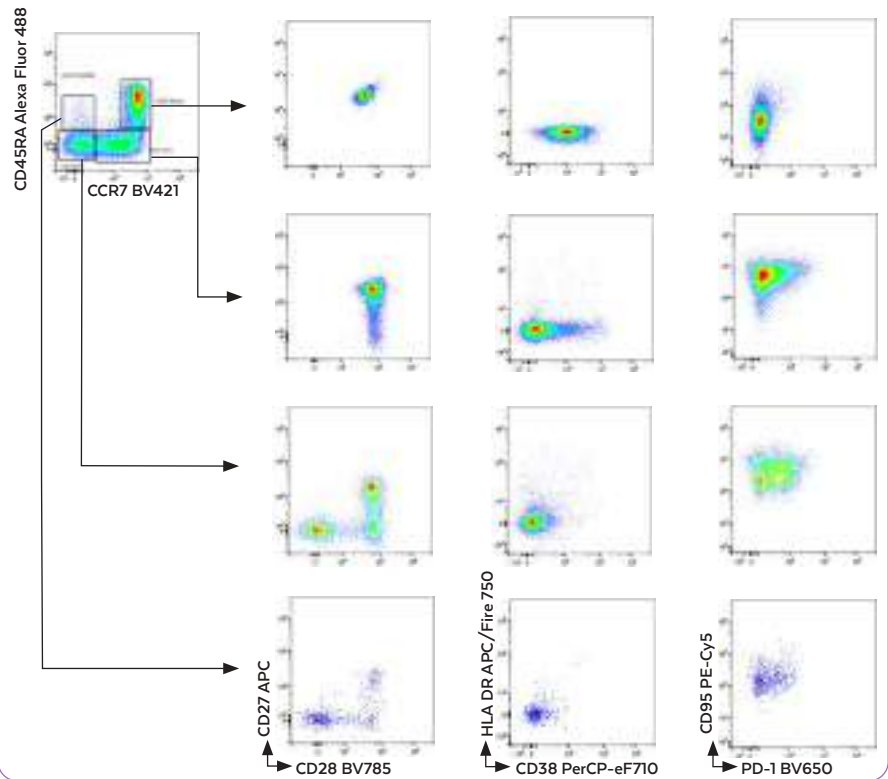




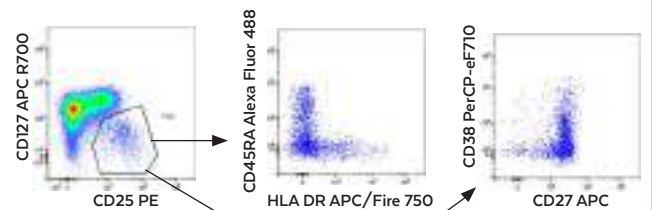
## CD8+ Effector Memory Cells



## CD4+ Effector Memory Cells



## Treg Cells



## See More with the UV Laser

With the addition of the UV laser and a total of 64 fluorescence detectors, the Aurora system now has the power to take highly-multiplexed assays beyond 30 colors. Incorporation of the UV laser takes the Aurora platform to the next level.

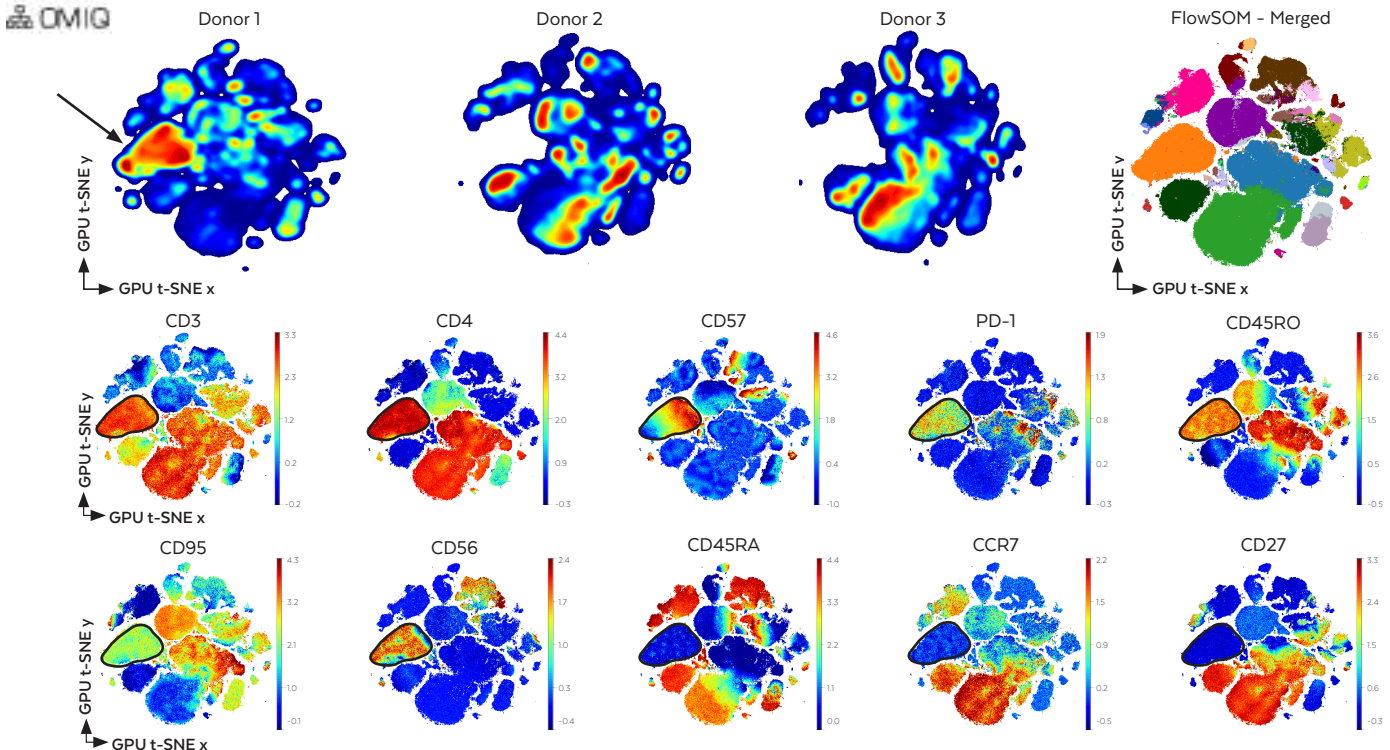
### 35-Color Panel

Markers and fluorochromes in a 35-color panel are summarized in the table below. Human peripheral blood mononuclear cells were stained, washed, and acquired on a five-laser Cytek Aurora™ system.

UV		Violet		Blue		Yellow Green		Red	
Specificity	Fluorochrome	Specificity	Fluorochrome	Specificity	Fluorochrome	Specificity	Fluorochrome	Specificity	Fluorochrome
CD45RA	BD Horizon™ BUV395	PD-1	BV421	CD86	BB515	CD335	PE	CD27	APC
CD16	BD Horizon™ BUV496	CD123	Super Bright 436	CD57	FITC	CD4	cFluor™ YG584	CD33	Alexa Fluor 647
CD14	BD Horizon™ BUV563	CD161	eFluor 450	CD19	Spark Blue™ 550	CD24	PE/Dazzle 594	CD127	APC-R700
CD11c	BD Horizon™ BUV661	IgD	BV480	CD45	PerCP	CD95	PE-Cy5	CD38	APC-eFluor 780
CD56	BD Horizon™ BUV737	CD3	BV510	CD11b	PerCP-Cy5.5	CD25	PE-Cy7		
CD45RO	BD Horizon™ BUV805	CD20	Pacific Orange	TCR γδ	PerCP-eFluor 710				
Dead Cells	LIVE/DEAD™ Blue	HLA DR	BV570						
		CD28	BV605						
		CXCR3	BV650						
		CCR6	BV711						
		CXCR5	BV750						
		CCR7	BV785						
		CD8	Qdot 800						

LIVE/DEAD™ is a trademark Thermo Fisher Scientific.  
cFluor™ is a trademark of Cytek Biosciences.  
Spark Blue™ is a trademark of BioLegend

### t-SNE and FlowSOM Analysis



t-SNE analysis of 35 colors immunophenotyping panel using OMIQ software ([www.omiq.ai](http://www.omiq.ai)). FCS files including only CD45+, singlets, and live cells were analyzed in OMIQ software. Scaling was optimized and t-SNE analysis was done using GPU t-SNE algorithm for all donors (top row). One cell subset was present only in donor one (see arrow in top row). Colored-continuous scatterplots for donor one showing marker expression in this unique subset are shown in the second and third rows. Clustering analysis by FlowSOM visualized by GPU-tSNE, shows metacluster two expressing CD3+/CD4+/CD57+/PD-1-/CD45RO+/CD95±/CD56±/CD45RA-/CCR7-/CD27-

## 2D Dot Plots



# SpectroFlo® Software Guided Workflows

The SpectroFlo® software offers an intuitive workflow from quality control (QC) to data analysis with technology-enabling tools that simplify running any application.

## QC and Setup:

Run Daily QC to monitor instrument performance and add reference controls.

## Library:

Add or remove experiment templates, worksheet templates, fluorochrome information, QC bead information, and more.



## Extra Tools:

Unmix data using controls from different experiments or apply virtual filters to your data.

## Users:

For administrative controls.

## Preferences:

Customize the software appearance. Set default plot sizes, text sizes and fonts, gate colors, print layout, statistics table options, and more.

## Experiment Workflow:

From the Acquisition menu, you can start a new experiment and get to your data in four simple guided steps.

### Step 1: Create Your Experiment



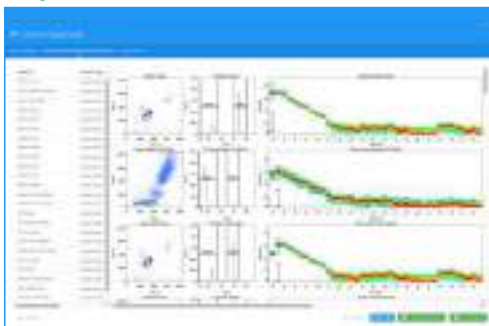
Create your experiment, choose fluorochromes, and add labels, tubes, worksheets, and stopping criteria in this guided workflow.

### Step 2: Acquire Your Tubes



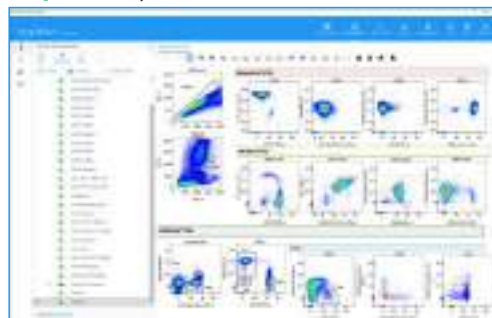
Load and run your tubes.

### Step 3: Unmix Your Data



Visualize your reference control spectra with the unmixing wizard.

### Step 4: Analyze Your Unmixed Data



Create an analysis worksheet and save it as a template to reuse and share with others.



## Get to Know Our New Automated Sample Loader (ASL)



**NEW**



### Meet the ASL

The ASL offers more versatility when running your samples at high-throughput. In addition to acquisition from 96-well plates, the ASL is compatible with 96-deep well plates and 40-tube racks. For each carrier type, Cytek has provided preset mixing speeds and frequencies, which are also fully customizable to meet your individual experimental requirements. The ASL is designed to streamline experimental workflows and integrates seamlessly into the Cytek Aurora™ system.

#### ➤ Reliable and flexible

**Reliable** acquisition from 96-well plates, 96-deep well plates, and 40-tube racks to improve lab productivity.

**Flexible** and effortless transition from plates to tubes in a matter of seconds.

#### ➤ Low carryover, high throughput

**Three throughput modes** optimized for 40-tube racks and for each plate type.

#### ➤ User customizable modes

**Fully customizable** with different mix speeds and timing to fit a variety of applications and workflow.





# We Are Here to Support You

Cytek Biosciences is dedicated to enhancing our customers' user experience. The Cytek Aurora™ system is backed by our world-class service and support team that can provide phone or field-based assistance. Various levels of maintenance options are available to meet your needs now, and in the future.

## Technical Support

We have a worldwide team of field service engineers and technical application specialists at your service. To maintain your instrument and keep it running well, you can choose the right service contract for your needs. Our technical application specialists are here to support you with application-related questions such as troubleshooting experiments, understanding or troubleshooting software behaviors, and more.

For help choosing the right service contract, contact your sales representative at [sales@cytekbio.com](mailto:sales@cytekbio.com).

For service and application support, contact us at [support@cytekbio.com](mailto:support@cytekbio.com).

## Training

We offer two days of in-depth, interactive, hands-on training with each new instrument installation. If you later have a need for additional training, we offer a shorter one day refresher option. To learn more, speak to your Cytek sales representative or email us at [sales@cytekbio.com](mailto:sales@cytekbio.com).

## Online Resources

As Cytek grows so will the tools on our website to enhance your experience with your full spectrum cytometer. For example, you can interact with other Cytek Aurora™ and Cytek Northern Lights™ system users and our technical application support staff in the Aurora User Community (contact your sales representative to learn how to activate your account). Need to learn more about dyes used on the Cytek Aurora™ system? Click on the reagents tab to find panel design examples and other optimization tools.

Visit [www.cytekbio.com](http://www.cytekbio.com) regularly as we introduce more exciting tools throughout the year.



# Specifications

## Optics

### EXCITATION OPTICS

#### OPTICAL PLATFORM

Fixed optical assembly with the capacity to be configured with up to five spatially separated laser beams. Laser delays are automatically adjusted during instrument QC

#### LASERS

Base model three-laser configuration:  
 405 nm: 100 mW, 488 nm: 50 mW, 640 nm: 80 mW  
 Available laser upgrades: 355 nm: 20 mW,  
 561 nm: 50 mW

#### BEAM GEOMETRY

Flat-Top laser beam profile with narrow vertical beam height

### EMISSION OPTICS

#### EMISSION COLLECTION

Fused silica cuvette coupled to high numerical aperture (NA) lens for optimum collection efficiency to optical fibers

#### FORWARD AND SIDE SCATTER DETECTION

FSC: high-performance semiconductor detector with 488 nm bandpass filter  
 SSC: two high-performance semiconductor detectors with 405 nm and 488 nm bandpass filters

#### FLUORESCENCE DETECTORS

Proprietary high sensitivity Coarse Wavelength Division Multiplexing (CWDM) semiconductor array per laser enabling more efficient spectrum capture in the 365 - 829 nm range. No filter changes required for any fluorochrome excited by the 355 nm, 405 nm, 488 nm, 561 nm, 640 nm lasers

#### STANDARD OPTICAL CONFIGURATION

Violet (405 nm) detector module: 16 channels unevenly spaced bandwidth from 420-829 nm  
 Blue (488 nm) detector module: 14 channels unevenly spaced bandwidth from 498-829 nm  
 Red (640 nm) detector module: 8 channels unevenly spaced bandwidth from 652-829 nm

#### 4 and 5 Laser Options:

Yellow-Green (561 nm) detector module: 10 channels unevenly spaced bandwidth from 567-829 nm  
 Ultraviolet (355 nm) detector module: 16 channels unevenly spaced bandwidth from 365-829 nm

## Fluidics

### SAMPLE FLOW RATES

Low: 15  $\mu$ L/min, Medium: 30  $\mu$ L/min, High: 60  $\mu$ L/min,  
 Plate high-throughput mode: 100  $\mu$ L/min

### FLUIDIC MODES

Fluidics startup, fluidics shutdown, sample injection tube (SIT) flush, purge filter, clean flow cell, long clean

### MANUAL SAMPLE INPUT FORMATS

12x75 mm polystyrene and polypropylene tubes

### STANDARD FLUIDIC RESERVOIRS

4L fluid container set with level-sensing provided.  
 Compatible with 20 L sheath and waste cubitainers

### VOLUMETRIC SENSOR

Volumetric measurement during sample recording enables calculation of counts per  $\mu$ L for any gated population without the need for counting beads

## Performance

### CARRYOVER

$\leq$  0.1% in manual tube mode

### DATA ACQUISITION RATE

Up to 35,000 events/sec

### FLUORESCENCE PERFORMANCE

#### FLUORESCENCE SENSITIVITY

FITC:  $\leq$  5 MESF

PE:  $\leq$  4 MESF

APC:  $\leq$  3 MESF

Pacific Blue:  $\leq$  4 MESF

\*Data averaged from multiple systems. Molecules of equivalent soluble fluorochrome (MESF) calculated based on unmix data accounting for autofluorescence of the unlabeled bead

#### FLUORESCENCE LINEARITY

FITC  $R^2 \geq 0.995$  / PE  $R^2 \geq 0.995$

### FLUORESCENCE PERFORMANCE

#### FORWARD SCATTER RESOLUTION

Performance is optimized for resolving lymphocytes, monocytes, and granulocytes

#### SIDE SCATTER RESOLUTION

Capable of resolving 100 nm polystyrene beads from noise. Violet SSC detectors, together with a flat-top laser beam profile with narrow vertical beam height helps support detection of small particles

### ENHANCED SMALL PARTICLE™ (ESP™) DETECTION OPTION

Improve side scatter resolution of small particles down to 70 nm polystyrene beads with optional ESP Detection Option

## Plate Loader Options

### AUTOMATED SAMPLE LOADER (ASL) AND AUTO MICRO-SAMPLING SYSTEM (AMS)

Plate stage temperature: 4-30°C (39.2-86°F) (AMS only)

### HIGH THROUGHPUT SPEED

ASL: 27 min for 96-well plate

AMS: 35 min for 96-well plate

\* Data averaged from multiple systems. Run in high-throughput mode (no agitation, no SIT flush) with 2 sec/ well stopping criteria

### INPUT COMPATIBILITY

ASL: 96-well plate, 96-well deep well plate, 384-well plate, 40-tube racks (12 x 75 mm)

AMS: 96-well plate only

### PLATE LOADER CARRYOVER

Default mode:  $\leq$  0.3%, Low Carryover mode:  $\leq$  0.1%, High Throughput mode:  $\leq$  1%

## Software

### SPECTROFLO® SOFTWARE

Developed with multicolor assays in mind

Streamlined workflows for experiment setup, data acquisition, and file export

Automated QC module

Live unmix during sample acquisition

Extract autofluorescence from samples

FCS 3.1 data file standards

## Electronics

### SIGNAL PROCESSING

Digital signal processing with automatic window gate adjustment

22-bit 6.5 log decades

Threshold using any single parameter or combination of parameters

### PULSE SHAPE PARAMETERS

Pulse Area and Height for every parameter. Width for scatter parameters and one fluorescence parameter for each laser.

## Workstation

Workstation specifications may vary between laser configuration

### COMPUTER SPECIFICATIONS

Operating system: Windows® 11 Pro 64-bit  
 Processor: Intel® Core™ i7-10700 processor or equivalent  
 RAM: 64 GB  
 Hard drive: 1 TB SSD and 2TB SSD (secondary)

### MONITOR

32" UHD 4K Monitor

## Installation Requirements

Dimensions (W x D x H)

### INSTRUMENT DIMENSIONS

Without loader: 54 x 52 x 52 cm  
 (21.3 x 20.5 x 20.5 in)

With loader: 58 x 62 x 52 cm  
 (23.0 x 24.4 x 20.5 in)

### INSTRUMENT WEIGHT

Instrument weight (5 lasers): 71 kg (156.5 lb)  
 Loader weight (AMS): 13 kg (28.7 lb)  
 Loader weight (ASL): 15 kg (33.1 lb)

### RECOMMENDED WORKSPACE

165 x 76 x 132 cm (65 x 30 x 52 in)

## Room Requirements

### POWER

100-140 VAC, 15 A or 200-250 VAC, 10 A

### HEAT DISSIPATION

500 W with all solid-state lasers

### TEMPERATURE

15-28°C (59-82.4°F)

### HUMIDITY

20%-85% relative non-condensing

### AIR FILTERING

No excessive dust or smoke

### LIGHTING

No special requirements

## Regulatory Status

Class 1 Laser Product

For Research Use Only. Not for use in diagnostic or therapeutic procedures



**For more information, email us at:**  
[sales@cytekbio.com](mailto:sales@cytekbio.com) or call 1-877-922-9835

## United States

### California

47215 Lakeview Blvd  
Fremont, CA 94538-6407  
1-877-922-9835

10840 Thornmint Road  
Suite 100  
San Diego, CA 92127

### Washington

645 Elliot Ave W.  
Suite 100  
Seattle, WA 98119

### Maryland

4520 East West Highway  
Suite 615  
Bethesda, MD 20814

## China

### Shanghai

560 Shengxia Road, Suite 603  
Zhangjiang High-Tech Park  
Shanghai Pilot Free Trade Zone, 201203  
Tel: 86-21-60897568 | Fax: 86-21-60897570

### Wuxi

D2, China Sensor Network  
International Innovation Park  
Linghu Avenue, Wuxi  
Jiangsu, China

## Japan

### Tokyo

Mitsui Link Lab Shinkiba1 #307  
Shinkiba 2-3-8, Koto-ku,  
Tokyo, Japan 136-0082

## Europe

### The Netherlands

Paasheuvelweg 25, Tower C5  
1105 BP Amsterdam  
The Netherlands  
+31 (0) 20 765 3440