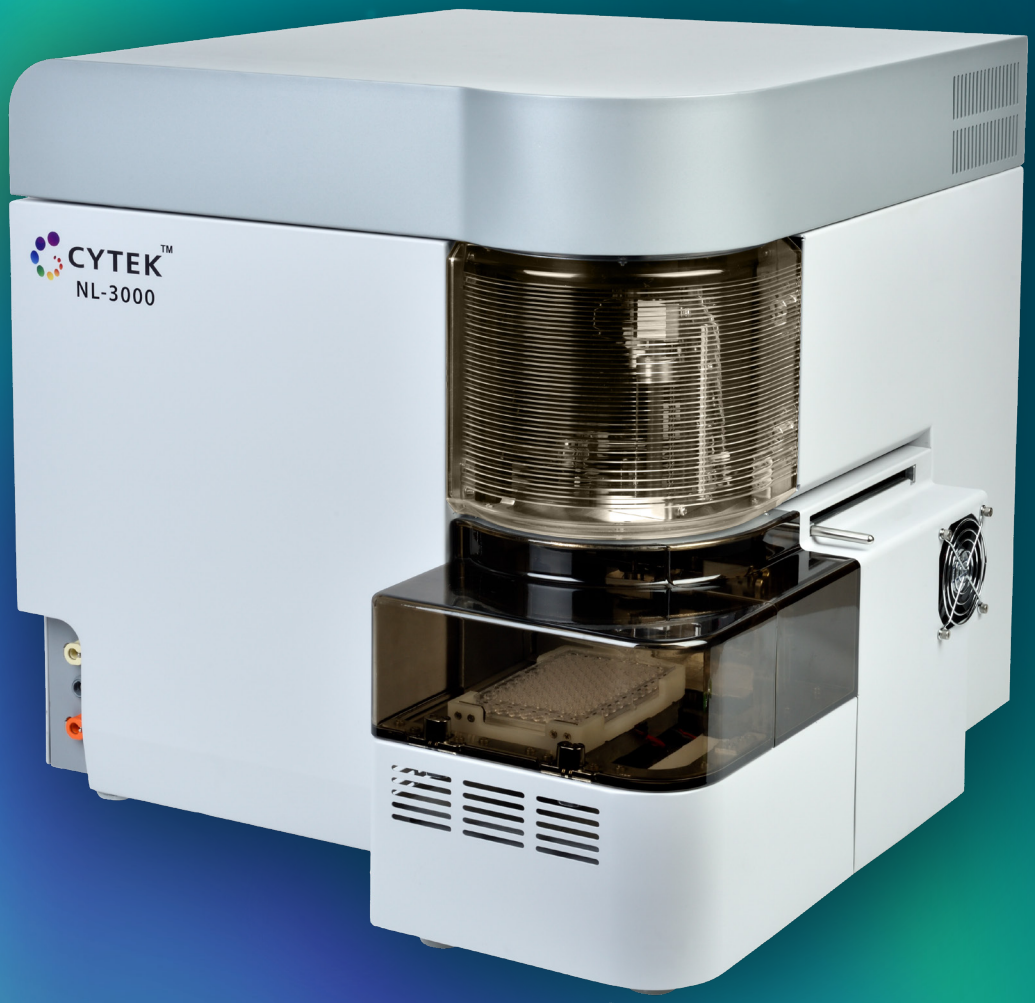
CYTEK®
TRANSCEND THE CONVENTIONAL



Cytek® Northern Lights™

Say Hello to a New Reality

Meet Northern Lights:

A new flow cytometry system that shifts the paradigm in what scientists expect to see in performance from an affordable three-laser system.

The Cytek Northern Lights system incorporates the same groundbreaking technologies as its older sister, the Cytek® Aurora. Like the Aurora system, its optical design and unmixing algorithm give scientists remarkable flexibility, enabling the use of a wide array of new fluorochrome combinations without reconfiguring the 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 sits in a sweet spot for scientists that have budgeted for a one to three laser system, but desire the ability to run panels of higher complexity.

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

The Cytek team has reimagined what you should expect from an affordable cytometer and has delivered an instrument that brings the benefits of full spectrum cytometry to more scientists.

High Value

Reconfigurable from one laser and nine colors to three lasers and 24 colors, there is a Northern Lights configuration to fit your needs.

Remarkable Sensitivity

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

Superb resolution of dim and rare populations, even in high complexity panels and high flow rates.

Easy, Flexible, and Intuitive

One configuration for all assays - no need to change optical filters.

Use any commercially available fluorochrome excited by the onboard lasers.

Intuitive software with familiar workflow.

Low Cost of Ownership

Fewer lasers to run more colors.

Low maintenance lasers, more fluorochrome choice, one configuration, and up to 24 colors per sample equates to **greater cost savings and less setup time between experiments.**

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Application Flexibility For More Users

The revolutionary technologies on board the Northern Lights system enable capabilities usually seen in much pricier systems. With its onboard 100mW 405nm laser (available with three-laser configuration only) and highly sensitive violet side scatter detector, particles nearing 100nm in size can be analyzed. The Northern Lights system opens the door to a wide variety of small particle applications. For those challenging applications involving highly autofluorescent particles, let the software's autofluorescence extraction tool bring new levels of resolution.

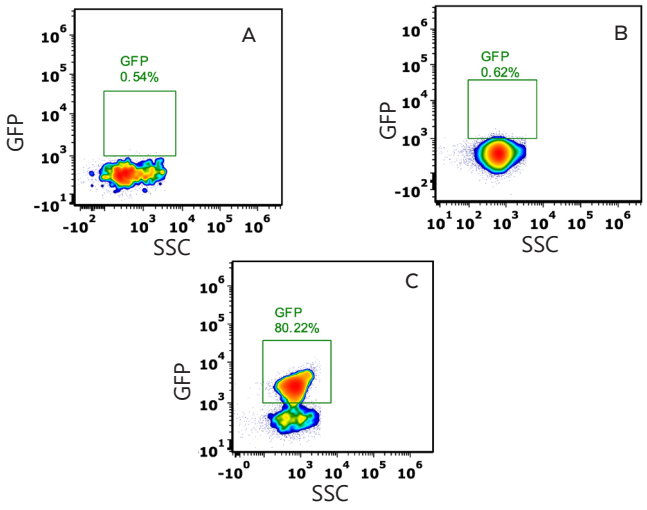
Small Particle Detection Example: ViroFlow

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)

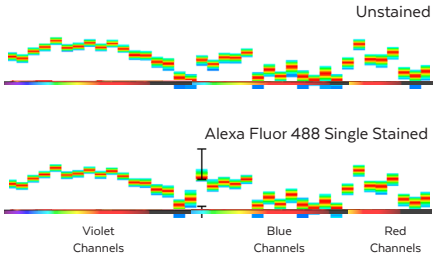
All samples were run on a three-laser Northern Lights system using violet SSC as a threshold trigger. Virus reference particles were provided by ViroFlow Technologies (www.viroflowtechnologies.com).



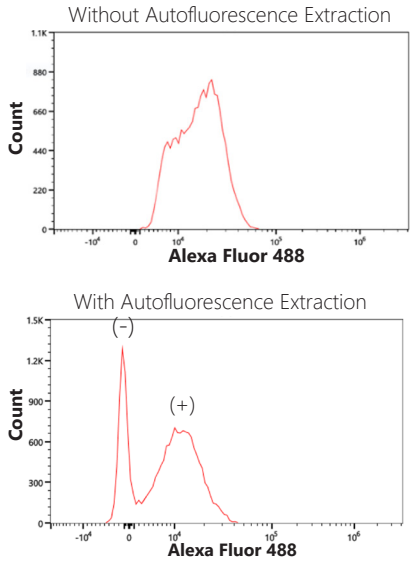
Data analyzed using FCS Express 6 by De Novo™ Software.

Autofluorescence Extraction Example: 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 Northern Lights 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 Northern Lights system. Note that the two spectra heavily overlap.



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

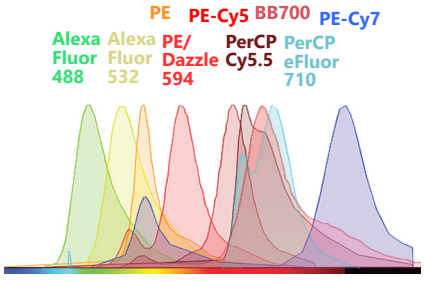
PrimeFlow™ is a trademark of Thermo Fisher Scientific.

The Power of Full Spectrum Cytometry

9-Color Blue Laser Panel

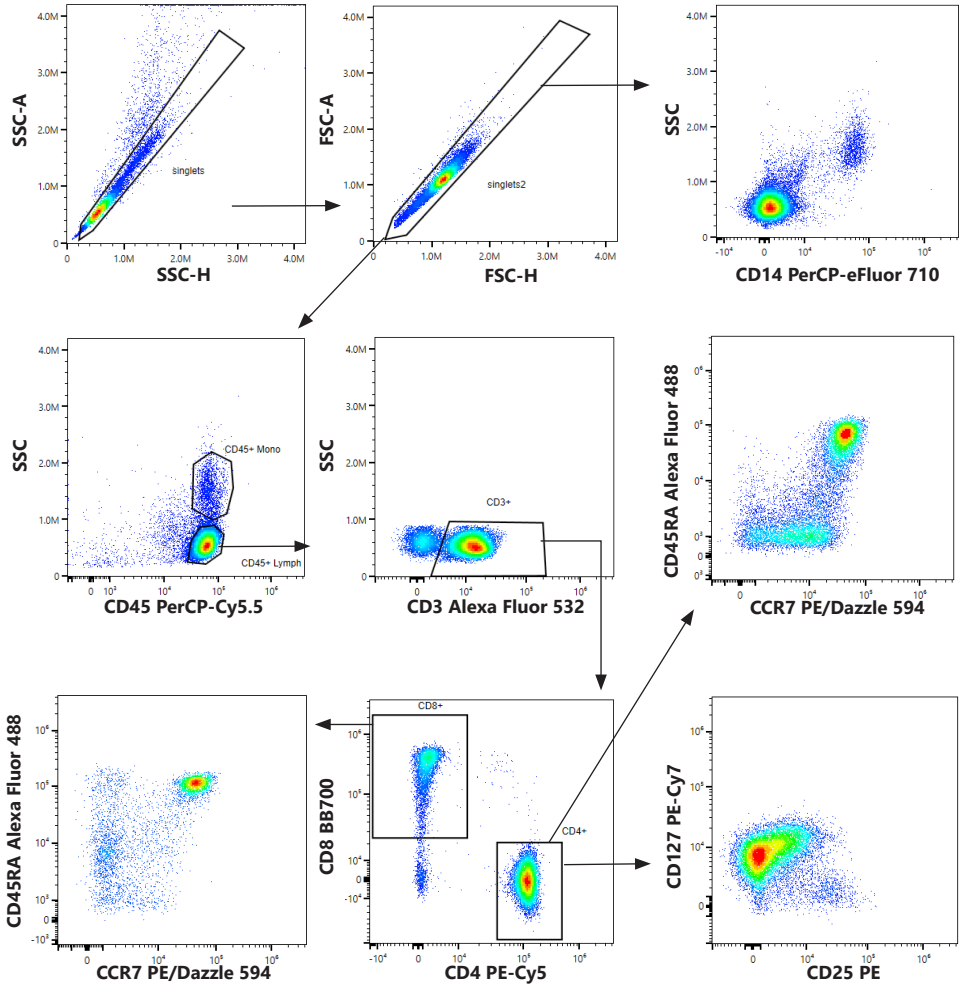
Peripheral blood mononuclear cells (PBMCs) were thawed, stained, washed, and analyzed on a one-laser Northern Lights system. In this nine color blue laser excitable dyes panel, monocytes and several CD4 T cell and CD8 T cell subsets were easily identified. Markers and fluorochromes used in this assay are summarized in the table below.

SPECIFICITY	FLUOROCHROME
CD45RA	Alexa Fluor® 488
CD3	Alexa Fluor® 532
CD25	PE
CCR7	PE/Dazzle™ 594
CD4	PE-Cy™5
CD45	PerCP-Cy™5.5
CD8	BD Horizon™ BB700
CD14	PerCP-eFluor® 710
CD127	PE-Cy™7



9-Color Panel Dyes Emission Spectra

Full spectrum cytometry opens a wide range of new possibilities. The Northern Lights system allows scientists to run complex multicolor experiments with as few as one or two lasers. The unique optical system enables the use of dyes with highly overlapping peak emissions without sacrificing resolution, translating to more flexibility in dye choice. Only one configuration is used for all applications, saving time in experimental setup, and minimizing the chance for experimental error. Experiments on the following pages are examples of what is possible with the Northern Lights system:



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24 Colors With Three Lasers...Is it Possible?

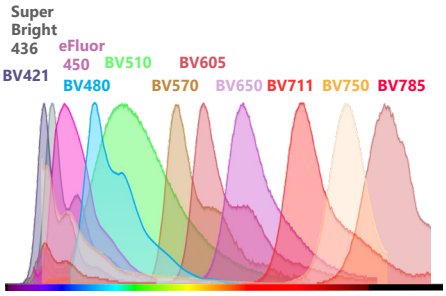
The optical design combined with the unmixing capability in SpectroFlo® software allows greater fluorochrome choice, panel flexibility, and easy setup without having to change filters. The three-laser configuration provides outstanding multi-parametric data for a wide array of applications. Markers and 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™				

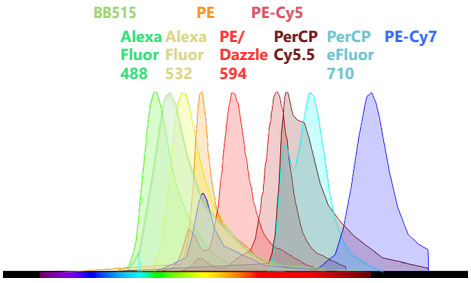
24-COLOR DATA

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

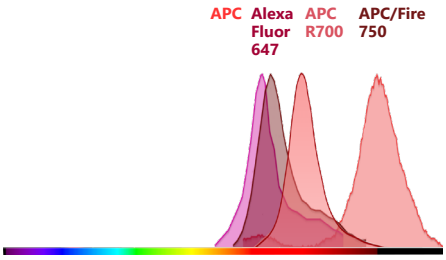
The 24-Color Panel Includes Many Highly Overlapping Dyes:



Violet Excited Dyes
Emission Spectra



Blue Excited Dyes
Emission Spectra



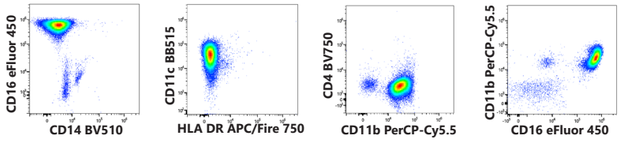
Red Excited Dyes
Emission Spectra

A New Reality:

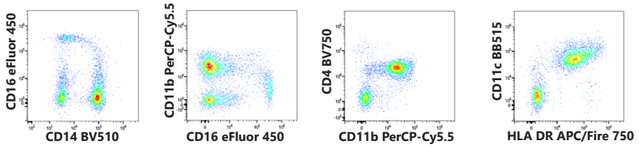
3 Lasers, 24 Colors, Unparalleled Resolution

Northern Lights Makes It Possible

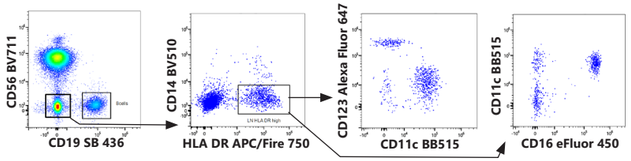
Granulocytes



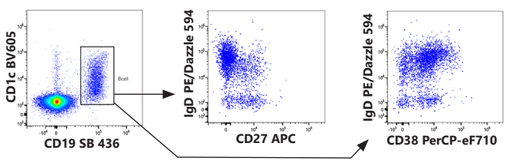
Monocytes

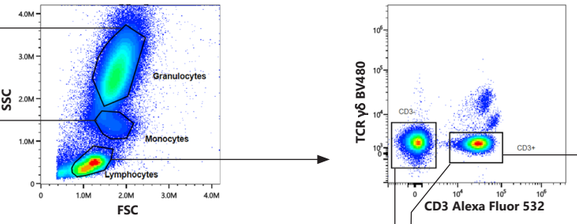


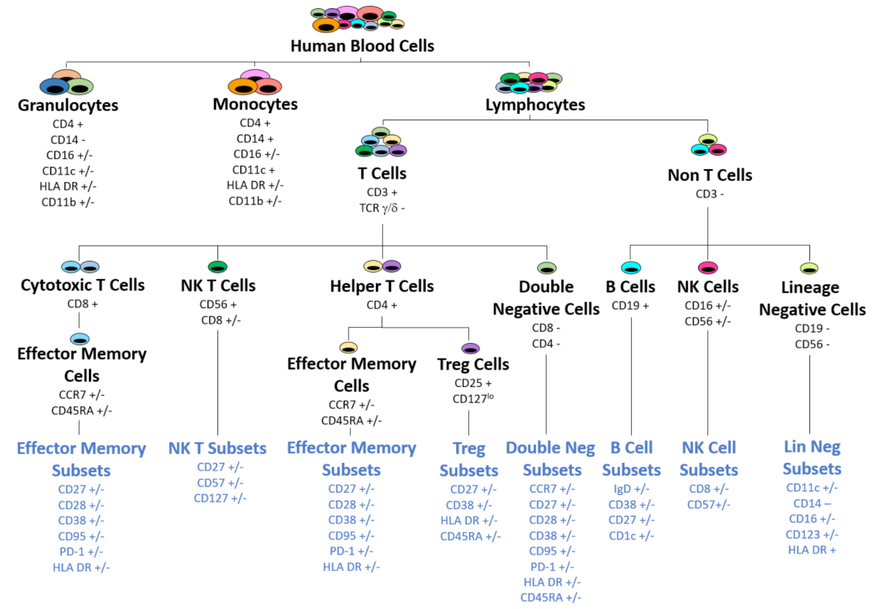
Lineage Negative Cells



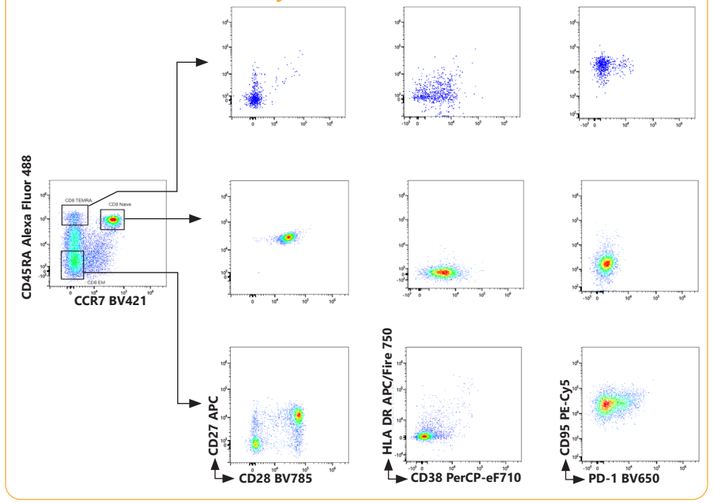
B Cells



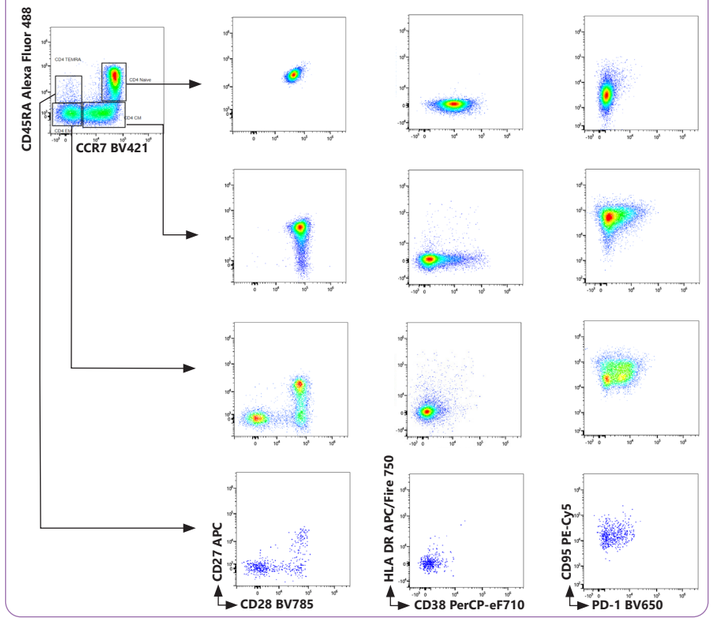




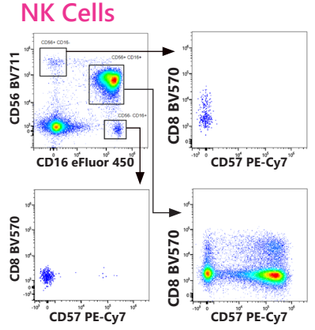
CD8+ Effector Memory Cells



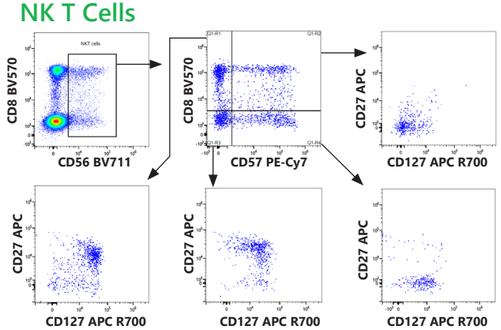
CD4+ Effector Memory Cells



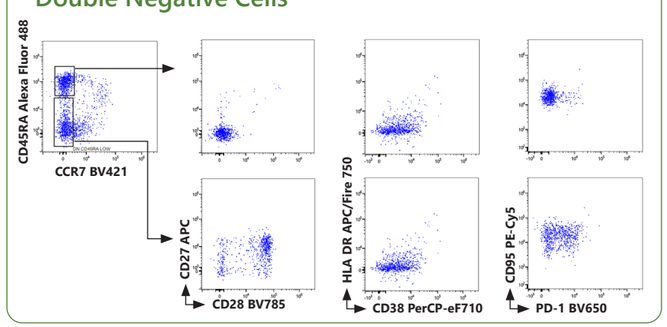
NK Cells



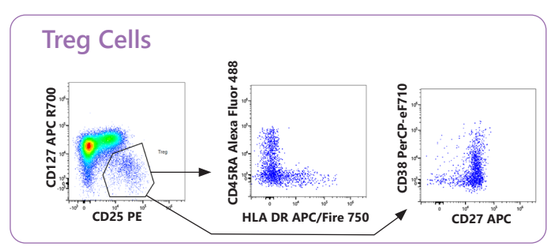
NK T Cells



Double Negative Cells



Treg Cells



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Fluorescent Proteins and Challenging Dye Combinations

The detection of some fluorescent protein or fluorochrome combinations by conventional flow cytometry presents a challenge due to high amounts of spectral overlap (Figures 1, 4). The Northern Lights 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: GFP and YFP

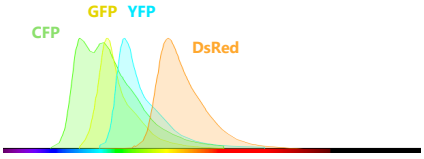

Figure 1: Spectrum plots from a conventional spectrum viewer shows heavy overlap between GFP and YFP.

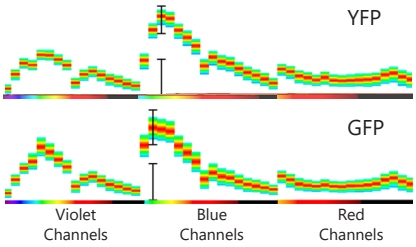

Figure 2: Spectrum plots from the Northern Lights system show distinct signatures across three lasers.

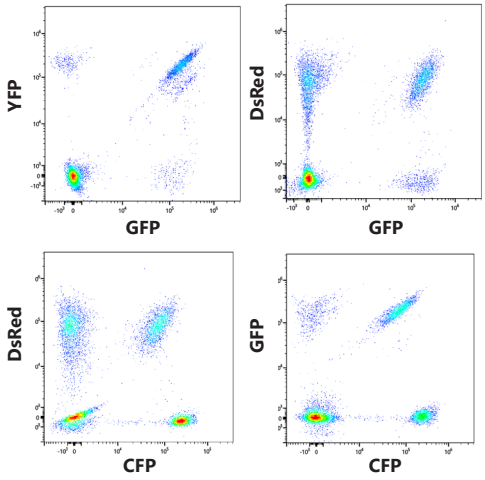

Figure 3: Sp2/0 cells were transfected with GFP, YFP, CFP and/or DsRed (alone or in combination) and run on the Northern Lights system (plots are gated on FSC vs SSC). Each population is clearly identified.

Example 2: Qdot 705 and BV711

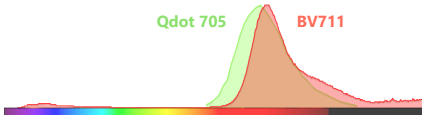

Figure 4: Spectrum plots from a conventional spectrum viewer shows heavy overlap between Qdot 705 and BV711.

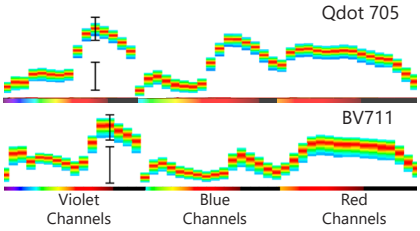

Figure 5: Spectrum plots from the Northern Lights system show distinct signatures for Qdot 705 and BV711.

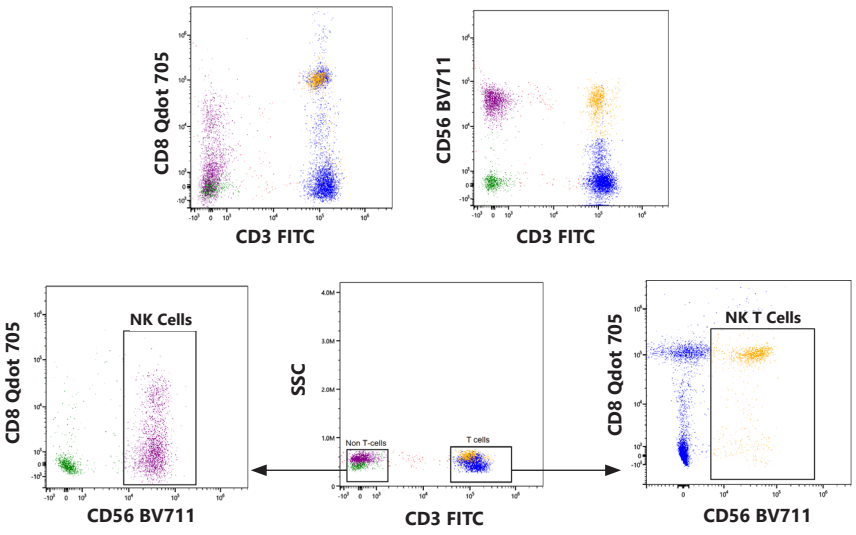

Figure 6: Normal human whole blood was stained, lysed, washed, and analyzed on the Northern Lights system. Subsets of NK and NK T cells that co-express CD56 BV711 and CD8 Qdot 705 were easily identified.

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Get to Know Our New Automated Sample Loader (ASL)

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 Northern Lights system.

Reliable and flexible

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

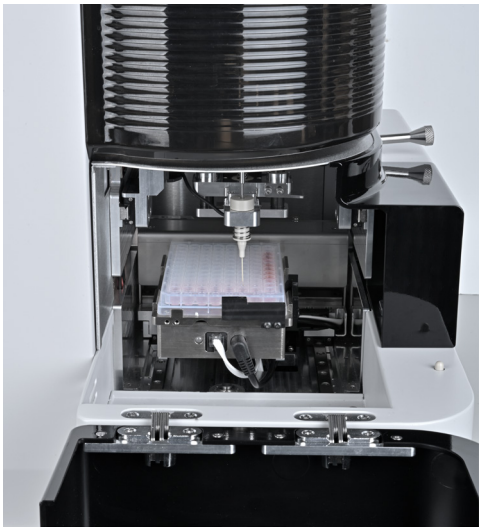
Flexible and effortless transition from plates to tubes in a matter of seconds.

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.

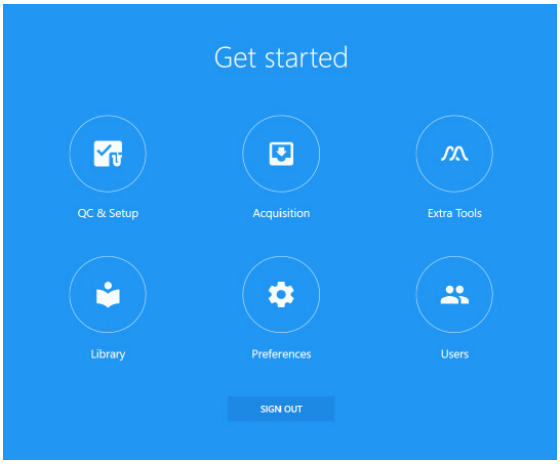


SpectroFlo® Software Guided Workflows

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.

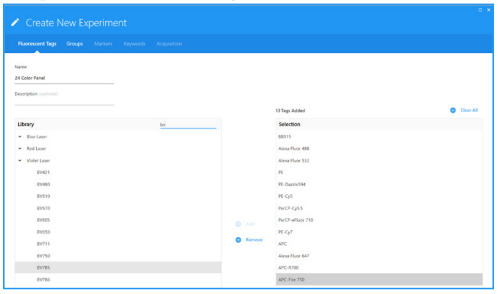
Users:
For administrative controls.

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

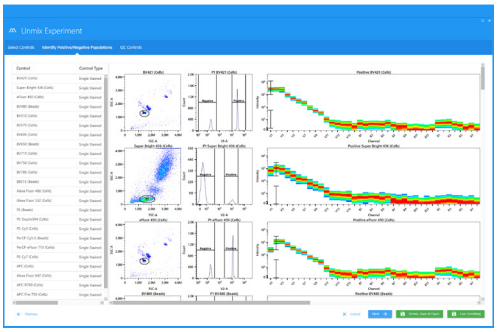


Create your experiment, choose fluorochromes, and add labels, tubes, worksheets, and stopping criteria in this guided workflow.

Step 2: Acquire Your Tubes

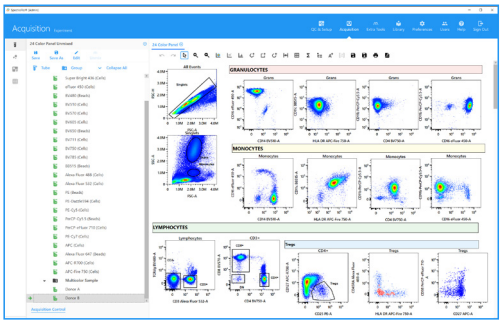
Load and run your tubes.

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.

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Specifications

Optics

EXCITATION OPTICS

OPTICAL PLATFORM
Northern Lights contains a fixed optical assembly configured with one to three spatially separated laser beams. Laser delays are automatically adjusted during instrument QC.

LASERS
One laser configuration: 488 nm: 50 mW
Two laser configuration: 488 nm: 50 mW, 640 nm: 80 mW
Three laser configuration: 405 nm: 100 mW, 488 nm: 50 mW, 640 nm: 80 mW

BEAM GEOMETRY
Flat-top laser beam profile with narrow vertical beam height optimized for small particle detection.

EMISSION OPTICS

EMISSION COLLECTION
Fused silica cuvette coupled to high 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 filter. Note: 405 nm side scatter applies to three laser configurations only.

FLUORESCENCE DETECTORS
Proprietary high sensitivity Coarse Wavelength Division Multiplexing (CWDM) semiconductor array per laser enabling more efficient spectrum capture in the 420-829 nm range. No filter changes required for any fluorochrome excited by the 405 nm, 488 nm, and 640 nm lasers.

STANDARD OPTICAL CONFIGURATION
Violet detector module (only available in three laser configurations): 16 channels uneven spaced bandwidth from 420-829 nm.
Blue detector module: 14 channels uneven spaced bandwidth from 498-829 nm.
Red detector module: 8 channels uneven spaced bandwidth from 652-829 nm.

Fluidics

SAMPLE FLOW RATES
Low: 15 µL/min, Medium: 30 µL/min, High: 60 µL/min, Plate high-throughput mode: 100 µL/min

FLUIDIC MODES
Long clean, SIT flush, Purge filter, Clean flow cell

MANUAL SAMPLE INPUT FORMATS
12x75mm polystyrene and polypropylene tubes

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

VOLUMETRIC SENSOR
Volumetric measurement during sample recording enables calculation of counts per µL for any gated population.

PLATE LOADER OPTIONS: ASL AND AMS
Plate stage temperature: 4-30˚C (AMS only)

HIGH THROUGHPUT SPEED
ASL Loader: 27 min for 96-well plate
AMS Loader: 35 min for 96-well plate

INPUT COMPATIBILITY
ASL Loader: 96-well plate, 96-deep well plate, 40-tube racks (12 x 75 mm)
AMS Loader: 96-well plate only

PLATE LOADER CARRYOVER
Default mode: ≤0.3%, Low Carryover mode: ≤0.1%, High Throughput mode: ≤1%

Performance

FLUORESCENCE LINEARITY
FITC R^2 ≥0.995 / PE R^2 ≥0.995

FORWARD AND SIDE SCATTER RESOLUTION
Performance is optimized for resolving lymphocytes, monocytes, and granulocytes.

SIDE SCATTER RESOLUTION
Capable of resolving 0.2µm beads from noise.

CARRYOVER
<0.1%

DATA ACQUISITION RATE
35,000 events/s*
*Three-laser system

Software

SPECTROFLO® SOFTWARE
Live unmixing during acquisition

Developed specifically to streamline assay setup, data acquisition, and file export

Automated QC module

Autofluorescence extraction

Raw and Unmixed FCS 3.1 files

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® 10 Pro 64-bit
Processor: Intel® Core™ i7 processor
RAM: 16 GB
Hard drive: 500GB SSD and 1 TB SATA
Video processor: NVIDIA® GeForce

MONITOR
32" UHD 4K Monitor

Installation Requirements

Dimensions (W x D X H)

INSTRUMENT DIMENSIONS
Without loader: 54 x 52 x 52 cm
With loader: 58 x 62 x 52 cm

INSTRUMENT WEIGHT
Instrument weight: 61 kg
Loader weight: 13 kg

RECOMMENDED WORKSPACE
165 x 76 x 132 cm

Room Requirements

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

HEAT DISSIPATION
500W with all solid-state lasers

TEMPERATURE
15-28˚C

HUMIDITY
20%-85% relative non-condensing

AIR FILTERING
No excessive dust or smoke

LIGHTING
No special requirements

Regulatory Status

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

CYTEK®

TRANSCEND THE CONVENTIONAL

Cytek Biosciences is dedicated to enhancing our customers' user experience. The Northern Lights 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.

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