

# BD LSR Cell Analyzer



Helping all people  
live healthy lives

Performance without peer,  
choice without compromise



# Performance without peer, choice without compromise

The ultimate tool for flow cytometry for choice, power, and consistency, BD™ LSR analyzers offer the most advanced and flexible products available for multicolor research. Designed to support the advanced assay development required for today's leading edge biomedical discoveries, BD LSR analyzers continue to deliver the latest in laser technology to researchers, with an unrivaled range of color, wavelength, and power choices.

Built on a proven platform, BD LSR analyzers feature innovative designs for both the excitation optics and collection optics that reduce excitation losses and dramatically improve light collection efficiency. The result is optical efficiency that delivers maximal sensitivity and resolution for multicolor applications.

BD LSR analyzers are available in recommended configurations or via the BD special order program. This innovative program allows researchers to configure their BD LSR analyzer in a way that best fits their research and assay needs. Researchers can configure the BD LSR with up to 7 lasers chosen from 11 different wavelengths. Multiple power options include the choice of air-cooled laser innovations across the full spectrum—from ultraviolet to infrared. All BD LSR analyzers may be upgraded subsequently with additional or new lasers from BD, as future user requirements dictate.

To ensure that BD flow cytometry products continue to offer superior performance, BD vigorously pursues the latest and best laser technologies, incorporating them as soon as they become available. The ever expanding list of available lasers is evidence of the ongoing commitment to continuous innovation that ensures, for example, that BD LSR analyzers continue to support the evolving needs of leading researchers around the world.

**As with all BD instruments and reagents, a full complement of highly qualified BD technical and application support personnel is available for help in streamlining research and maintaining optimal instrument performance.**

## Highest Performance

# Choose from Preconfigured and Special Order Analyzers

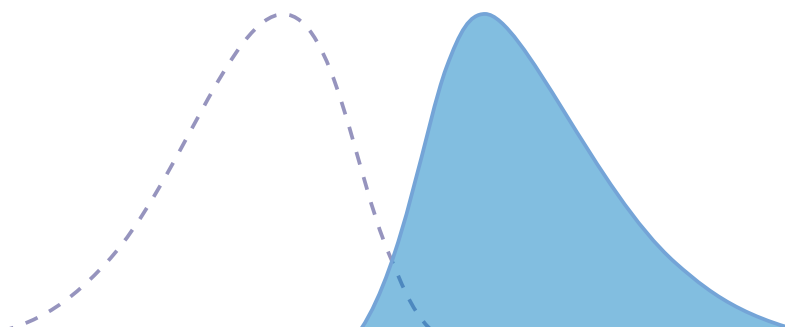
Preconfigured and special order BD LSR products meet a variety of site and assay needs. The preconfigured BD LSR II can meet most of the commonly encountered assay requirements. A special order program from BD offers specific laser, filter, and detector configurations to exactly match lab and assay requirements. As future needs arise, lasers can be added or upgraded on the preconfigured and special order products.

### Preconfigured BD LSR II

Based on over 10 years of experience in the support of core laboratories and advanced research requirements, BD provides a selection of preconfigured BD LSR II analyzers recommended for multicolor flow cytometry research.

An affordable and reliable analyzer, the BD LSR II is configured with up to 4 lasers—blue, red, violet, and UV—at recommended wavelengths and power settings that can meet most flow cytometry needs. In addition, a defined set of optical filters engineered to meet or exceed the majority of today's assay requirements enables the instrument to detect up to 18 colors simultaneously.

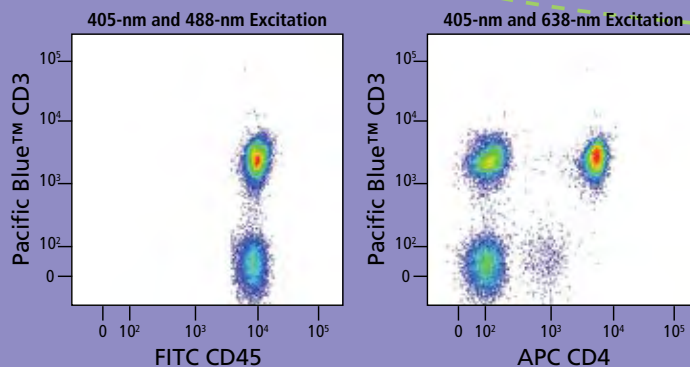
Sample introduction in the BD LSR can be accomplished by single tube, or by the optional BD™ High Throughput Sampler (HTS) that supports 96 or 384-well microtiter plates.



### Analysis of human lymphocytes

These data demonstrate the excitation of seven fluorochromes using a seven-laser special order BD LSR II cell analyzer. Each spatially separated beam provides discrete fluorochrome excitation, resulting in virtually no computer compensation required for complete cell population separation.

*The BD LSR II analyzer was configured with the following lasers: 20-mW 355-nm UV, 50-mW 405-nm violet, 100-mW 488-nm blue, 150-mW 532-nm green, 50-mW 594-nm yellow, 40-mW 638-nm red, and 25-mW 785-nm IR.*



# BD LSR II

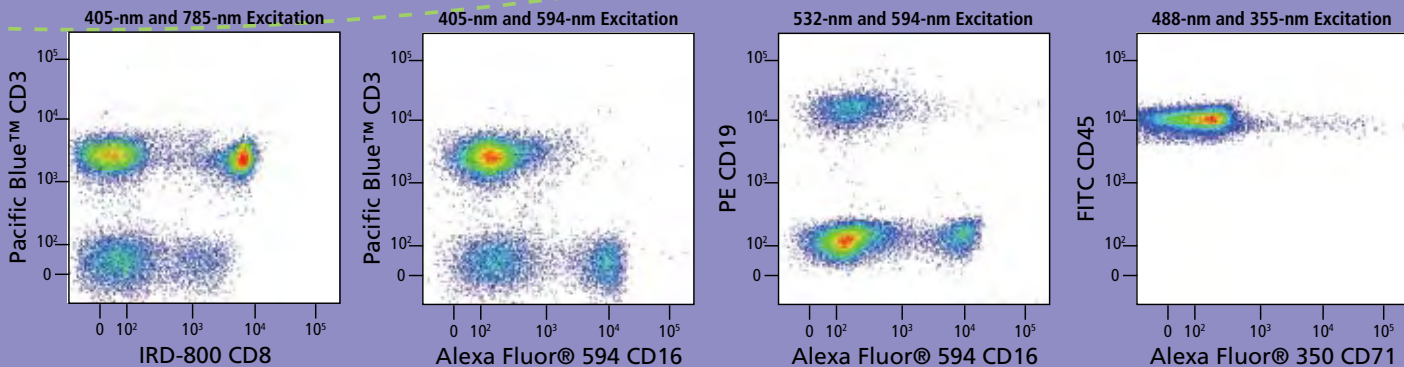
## Special order BD LSR II

Researchers on the leading edge of biomedical discovery will find that the special order BD LSR II offers emerging technologies and fully customizable configurations that deliver added flexibility and power to support their research.

The special order BD LSR II has the capacity to support up to 7 lasers and has 56 positional choices for selection of the detectors. It can be designed to meet the multicolor analysis needs of high-end research, where complex experiments may require a specific combination of unique lasers, detectors and filters to meet demanding assay requirements.

The lasers for the special order BD LSR II may be chosen from more than 11 laser wavelengths and multiple power options for maximum flexibility of configuration. This broad flexibility enables the special order BD LSR II analyzer to be easily set up for multicolor experiments, maximizing resolution and minimizing spectral spillover.

Laser and detector options are supported by a choice of filters that can be configured to almost any dye across the spectrum. This allows researchers to designate reagents based on maximal signal strength and minimal cross-talk, to increase resolution of dim populations by reducing spectral spillover and compensation challenges.



Data courtesy of Frederic Preffer (Department of Pathology, Massachusetts General Hospital, Boston MA). This work was supported by NIH funds supplied by 1S10RR014904-01, 1S10RR020936-01, 5U54HL081030-04, and 1P01CA111519-03.

Smaller Footprint, Boundless Potential

## Special Order BD LSRFortessa

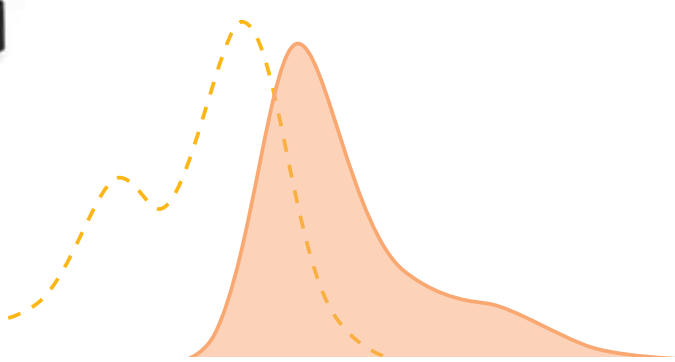
The special order BD LSRFortessa™ cell analyzer puts the power of the proven BD LSR platform into a compact footprint. Approximately half the size of the BD LSR II, it can easily fit on the benchtop for cost effective space utilization. This space efficiency is even more important for placement of the BD LSR in labs with limited space or where space cost is premium, for example, in a lab located in a dense urban setting or in a biocontainment facility.

From a wide range of choices, researchers can configure the special order BD LSRFortessa analyzer to meet their exact assay requirements. A selection of five lasers from more than 11 wavelengths, 30 positional choices for the detectors, and multiple power options are available. The special order BD LSRFortessa can detect up to 18 colors simultaneously and can be upgraded later with additional or new lasers from BD, as future requirements dictate.

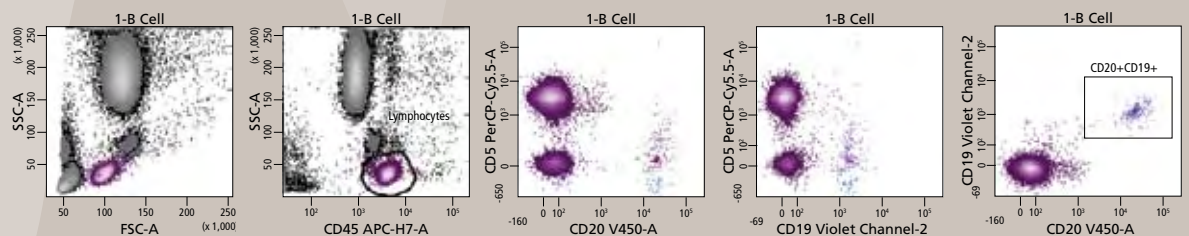
In addition to the reduced size, design enhancements allow for easier access to bandpass filters and mirrors, simplifying changes to experiment setup.



BD High Throughput Sampler (HTS)

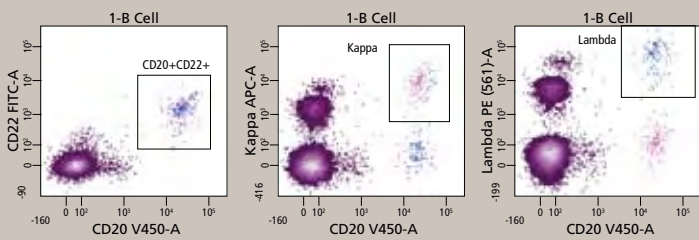


### Analysis of human B cells



These data show excitation of eight fluorochromes using a four-laser special order BD LSRFortessa cell analyzer. Subpopulation gating effectively identified cells with Kappa and Lambda expression.

The special order BD LSRFortessa analyzer was configured with the following lasers: 60-mW 355-nm UV, 100-mW 450-nm violet, 100-mW 488-nm blue, and 40-mW 640-nm red.



Tube: B Cell

Population	#Events	%Parent	%Total
All Events	30,000	####	100.0
Lymphocytes	5,945	19.8	19.8
CD20+CD19+	233	3.9	0.8
CD20+CD22+	231	3.9	0.8
B Cells	231	3.9	0.8
Kappa	130	56.3	0.4
Lambda	107	46.3	0.4

## Superior Performance

# Unique and Revolutionary Designs for Multicolor Analysis

Many innovations are incorporated into the BD LSR product line. At the heart of the cytometer, for example, the fluidics system features a true fixed alignment flow cell gel-coupled to the collection optics to maximize detector signal.

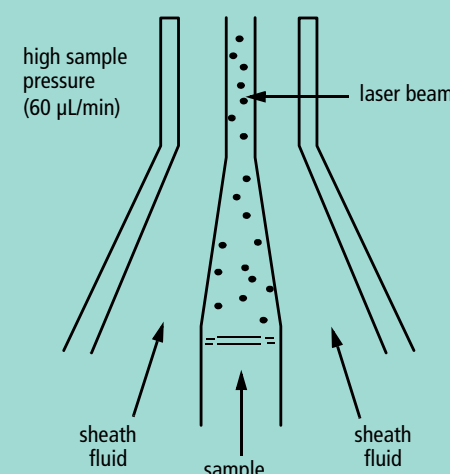
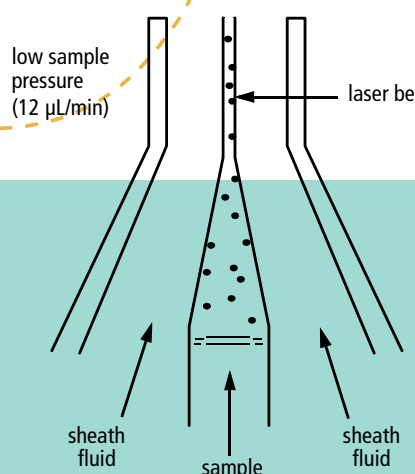
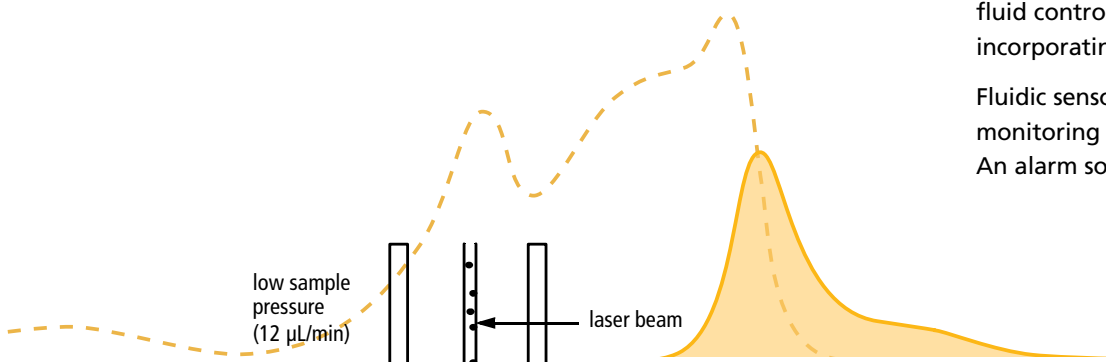
### Fluidics System

The fluidics system is pressure driven. Hydrodynamic focusing forces sample cells through a gel-coupled cuvette flow cell where they are interrogated. The flow cell is in fixed alignment with the laser and gel-coupled to the collection optics. This helps to ensure that the laser is precisely focused on the sample stream and that the maximum amount of emitted light can be collected to generate the greatest amount of signal for added sensitivity in multicolor applications. Fixed alignment also minimizes startup time, improves experiment-to-experiment reproducibility, and enables automated daily quality control.

The sheath container (8 L) and waste container (10 L) are outside the cytometer positioned on the floor.

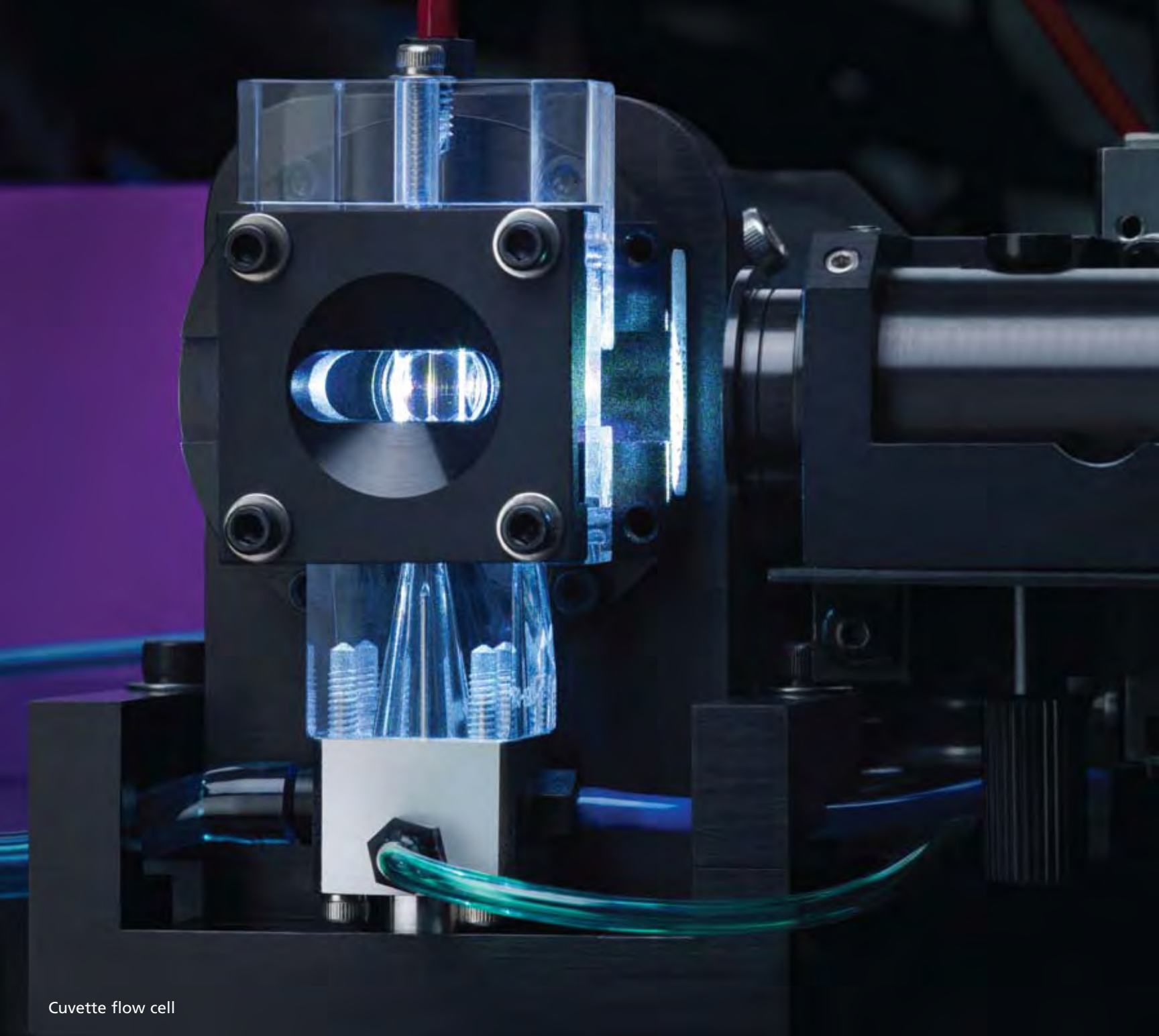
The optional BD FACSTFlow™ Supply System fluidics cart increases capacity and ease of use while maintaining a stable fluidics pressure. It includes an automated sheath and waste fluid control system that reduces daily maintenance by incorporating two 20-L containers (Cubitainers®).

Fluidic sensors maintain constant pressure, while a fluidics monitoring system warns when sheath fluid is low or empty. An alarm sounds when the waste container is full.

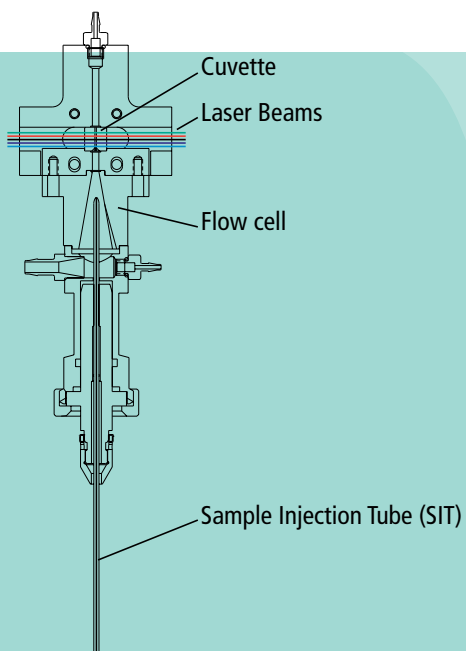


**Hydrodynamic focusing of the sample core through the flow cell**





Cuvette flow cell



#### Cuvette flow cell

Hydrodynamic focusing within the flow cell forces particles through the cuvette in a single-file stream where laser light intercepts the stream at the sample interrogation point. The unique flow cell design permits particles to flow through the cuvette at a low velocity, allowing longer exposure to laser energy. This ensures optimal resolution and sensitivity.

Maximum Signal, Minimal Crosstalk

## An Innovative and Proven Platform for Multicolor Analysis

Innovations in the design of the BD LSR II optical system, pioneered by BD, efficiently maximize signal detection and greatly increase sensitivity and resolution for each color in a multicolor assay. Researchers can identify cells, especially dim and rare cell populations, thus optimizing multicolor assays and panel design for superior results.

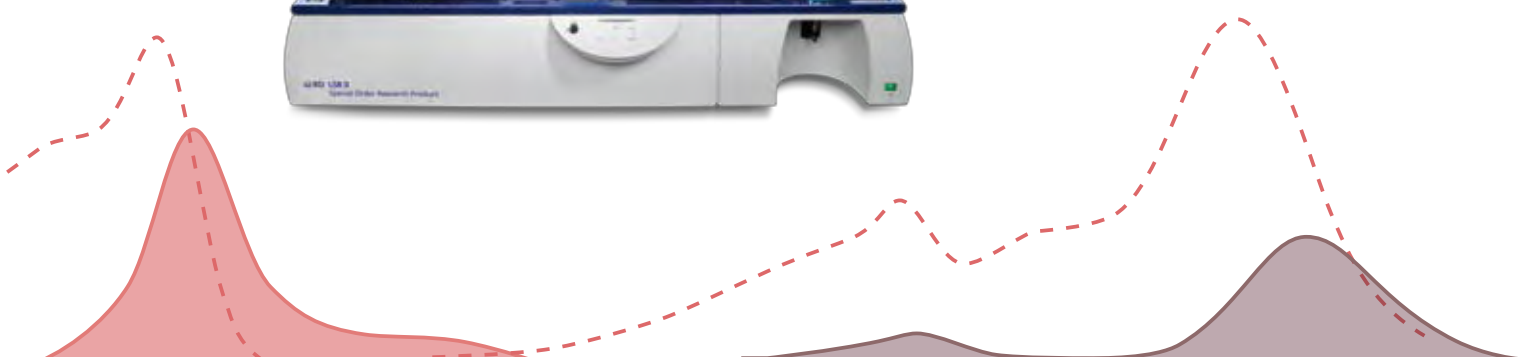
### Optics System

The optics system consists of laser excitation optics that illuminate cells in the sample, and collection optics that direct light scatter and fluorescence signals through spectral filters to detectors. Innovative designs for both the excitation optics and collection optics in BD LSR products reduce excitation losses and dramatically improve collection efficiency, yielding more information from each sample.

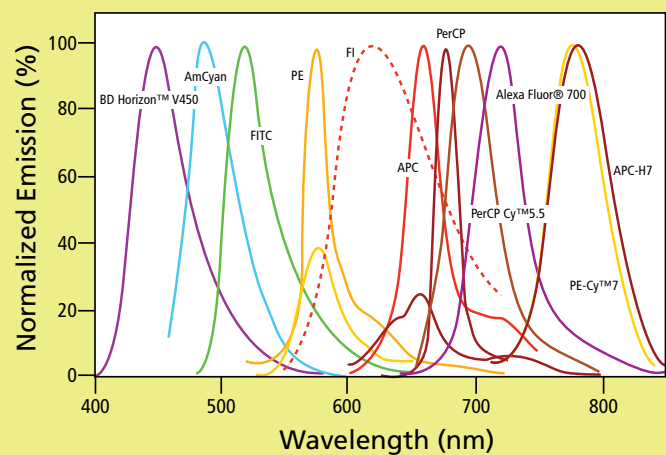
### Excitation Optics

The excitation optics consist of multiple fixed wavelength lasers, beam shaping optics, and achromatic focusing lenses which produce spatially separated beam spots.

Each lens focuses the laser light into the gel-coupled cuvette flow cell. Since the optical pathway and the sample core stream are fixed, alignment is constant from day to day and from experiment to experiment.



Emission spectra of commonly used fluorochromes



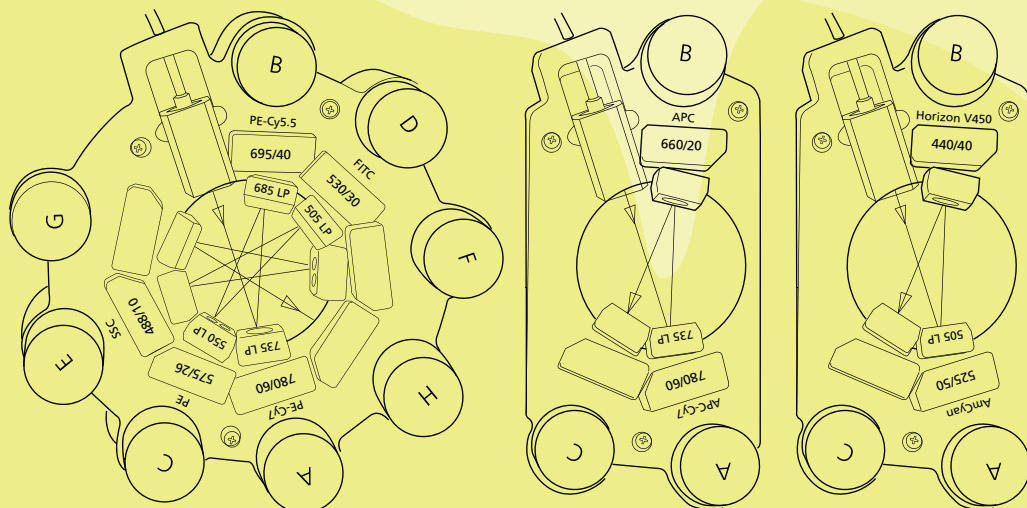


### Collection Optics

Emitted light from the gel-coupled cuvette is delivered by fiber optics to the detector arrays. The collection optics are set up in patented octagon- and trigon-shaped optical pathways that maximize signal detection resulting from each laser illuminated beam spot. Bandpass filters in front of each PMT allow spectral selection of the collected wavelengths. Importantly, this arrangement allows filter and mirror changes within the optical array to be made easily and requires no further alignment for maximum signal strength.

This design is based on the principle that light reflection is more efficient than light transmission. Emitted light travels to each PMT detector via reflection and is transmitted through only two pieces of glass to reach the detector. Therefore, more colors can be detected with minimum light loss.

Pathways for transmission optics: blue octagon, red trigon, violet trigon



## Greater Consistency

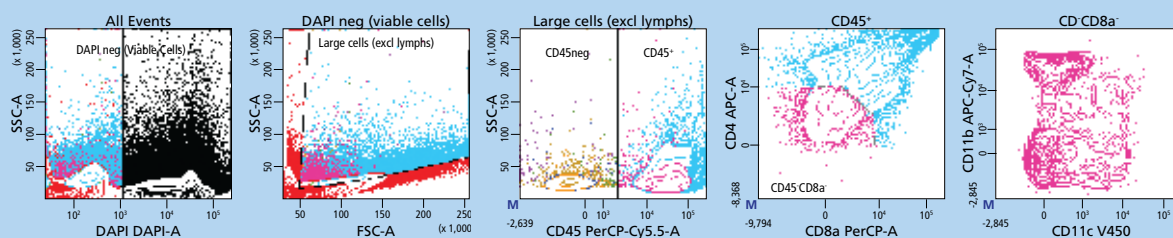
# Automated Controls for Setup, Acquisition, and Analysis

BD FACSDiva™ software efficiently controls the setup, acquisition, and analysis of flow cytometry data from the BD LSR workstation. BD FACSDiva operating software is common across many BD cell analyzers and cell sorters, including BD FACSCanto™ and BD FACSAria™ systems. Researchers gain application flexibility because it is easier to move the assay design and optimization to another platform, for example, from analysis to sorting.

### Cytometer Setup and Tracking

For preconfigured instruments, the Cytometer Setup and Tracking (CS&T) feature of BD FACSDiva software establishes baseline settings and adjusts for instrument variability. The software helps reduce chances of operator error, and ensures consistency of results. It allows for the creation of application specific settings for rapid performance of routine experiments in a more consistent manner. Tracking capabilities in the software measure a number of instrument settings and report on performance. Levey-Jennings plots help users understand instrument performance and identify maintenance issues.

### Comprehensive characterization of murine thymic stromal cells

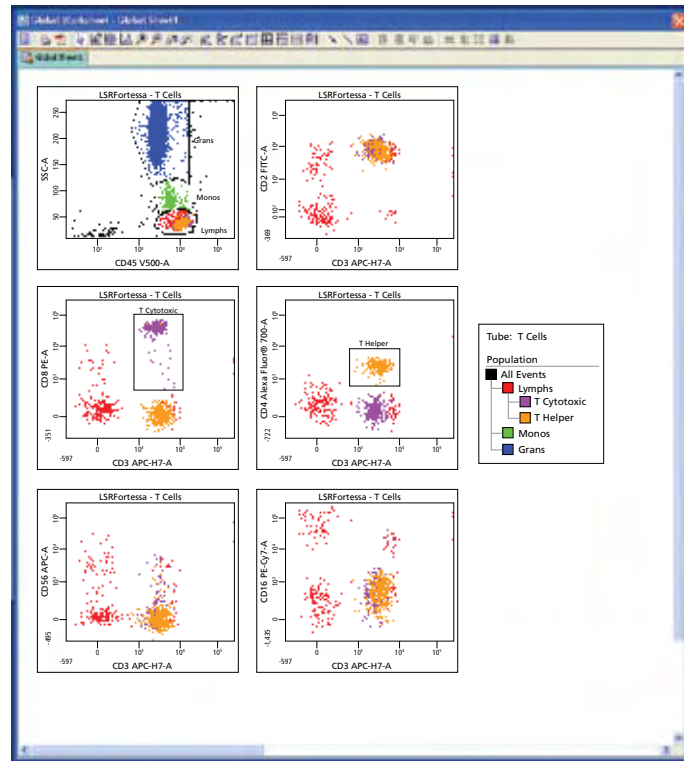


Multicolor flow cytometry achieved comprehensive characterization of the stromal cell components of the thymus. The special order BD LSR II cell analyzer was used with an 11-color staining panel to identify thymic hematopoietic and non-hematopoietic stromal subset populations.

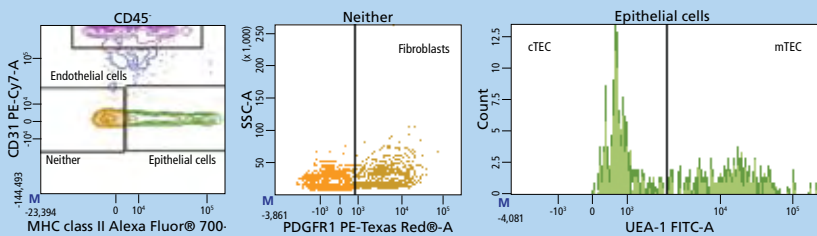
## Acquisition and Analysis

BD FACSDiva software enables researchers to preview and record data from multiple samples with an automated acquisition process. Acquisition templates, user-definable experiment layouts, and simple compensation procedures also managed by the software, further facilitate acquisition.

For analysis, the software includes powerful features such as hierarchical snap-to gating, a variety of plots, and batch analysis. Recorded data can be analyzed by creating plots, gates, population hierarchies, and statistical views on a BD FACSDiva global worksheet. Once the global worksheet is saved, it can be used to analyze multiple sample tubes from an experiment, thereby saving time. Numerous other productivity benefits come from features such as user-definable batch analysis and automated capabilities such as gate resizing, pausing between data files, exporting statistics, and printing before proceeding to the next data file.



BD FACSDiva Worksheet showing well-defined T cell population subsets taken using the special order BD LSRFortessa analyzer configured with the following lasers: 60-mW 355-nm UV, 100-mW 450-nm violet, 100-mW 488-nm blue, and 40-mW 640-nm red.



Tube: Thymic stromal cells

Population	#Events	%Parent	%Total
All Events	1,548,645	####	100.0
DAPI neg (viable cells)	1,173,319	75.8	75.8
Large cells (excl lymphs)	63,088	5.4	4.1
CD45neg	2,773	4.4	0.2
Epithelial cells	304	11.0	0.0
cTEC	174	57.2	0.0
mTEC	130	42.8	0.0
Endothelial cells	256	9.2	0.0
Neither	2,067	74.5	0.1
Fibroblasts	1,090	52.7	0.1
CD45+	60,334	95.6	3.9
CD4 CD8a	5,548	9.2	0.4

Data courtesy of Sydney X Lu and Marcel RM van der Brink (Memorial Sloan-Kettering Cancer Center, New York, NY).

## Services

BD Biosciences is fully committed to the success and satisfaction of its customers. Supporting flow cytometry applications for over 35 years, BD training, support, and field service teams are dedicated to helping customers achieve optimal instrument performance, ease of use, and streamlined workflow. With unmatched flow cytometry experience, this world-class service organization is available to help your BD LSR product installation, future upgrades, and application support.

### **Training**

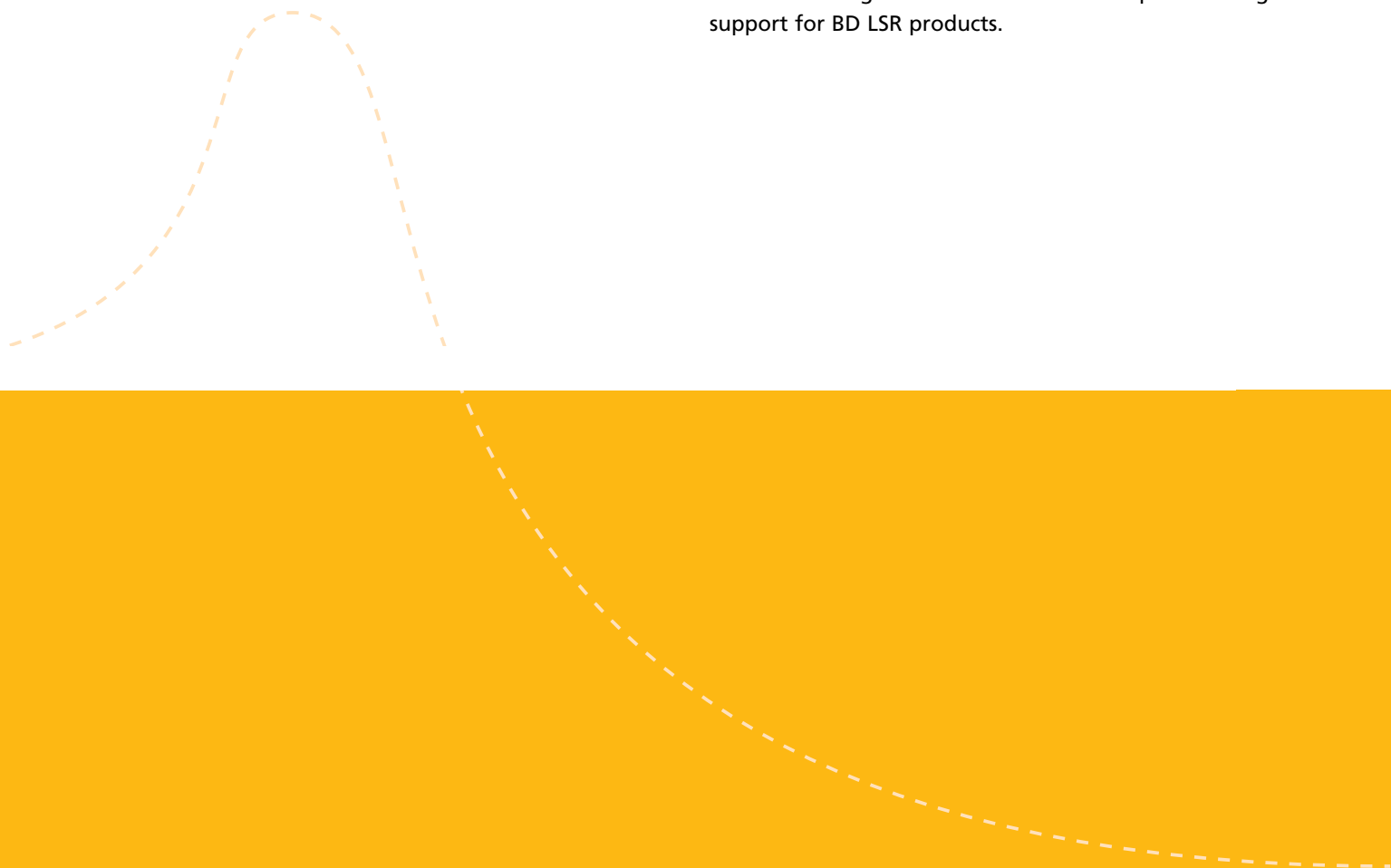
Hands-on training is included with each BD LSR product. Training courses are held at BD training centers worldwide. BD flow cytometry training courses combine theory and practice to provide participants with the skills and experience they need to take full advantage of the capabilities of their BD LSR product.

### **Technical Application Support**

BD Biosciences technical applications support specialists are available to provide field- or phone-based assistance and advice. Expert in all aspects of flow cytometry, BD technical application specialists are well equipped to address customer needs in both instruments and applications support.

### **Field Service Engineers**

When instrument installation or service is required, a BD Biosciences Technical Field Service Engineer can be dispatched to the customer site. BD Biosciences field service engineers are located across the world. On-site service and maintenance agreements are available to provide long-term support for BD LSR products.





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