

# BD LSRFortessa™ X-20

Special Order Product



Designed for limited space  
and boundless potential



## Next generation high performance cell analyzer

The BD LSRFortessa™ X-20 cell analyzer delivers high performance, multicolor analysis with the most compact footprint in its class at just 30 x 29 in. (76.2 X 73.7 cm) and a height of just 30 in. (76.2 cm).

The BD LSRFortessa X-20 can be configured with up to 5 lasers, which enables the detection of up to 20 parameters simultaneously. The most common laser choices are blue, red, violet, yellow-green, and UV. Additional laser choices are available and may be configured at the time of purchase or at a later date to meet evolving application requirements.

The BD LSRFortessa X-20 is supported by a full range of BD Biosciences reagents, including the latest BD Horizon™ Brilliant Violet™ polymer conjugates, which offer superior brightness and are optimized for use on the BD LSRFortessa X-20.

The BD LSRFortessa X-20 cell analyzer is the latest in the line of high-performance instrumentation from BD Biosciences.

Based on the industry-leading BD LSRFortessa™ analyzer, the BD LSRFortessa X-20 integrates the newest laser and light technologies, in a greatly reduced footprint. The BD LSRFortessa X-20 retains the flexibility to support the expanding needs of multicolor flow cytometry assays.

Performance without peer, choice without compromise

# The most compact footprint in its class

The BD LSRFortessa X-20 is designed to support your current assay requirements. In addition, as future needs arise, optical capability can be added or upgraded.



## Flexibility in a small space

The BD LSRFortessa X-20 fits most flow cytometry analyzer needs, and can be ordered with up to 5 lasers—most commonly, blue, red, violet, yellow-green, and UV—which provides flexibility in laser wavelengths. This allows researchers to optimize assay design by selecting the latest fluorescent dyes and antibodies in experimental protocols. The instrument can accommodate the detection of up to 18 colors simultaneously with a defined set of optical filters that meet today's assay requirements.

A compact footprint and height (30 x 29 x 30 in. or 76.2 x 73.7 x 76.2 cm) allow the BD LSRFortessa X-20 to fit easily on the benchtop for the cost-effective use of valuable laboratory space. In addition to the reduced size, design enhancements provide easier access to bandpass filters and mirrors, simplifying changes in the instrument configuration.

To improve experimental workflow, the optional BD™ High Throughput Sampler (HTS) provides rapid, fully automated sample acquisition from microtiter plates. In high-throughput mode, the HTS option can speed through a 96-well plate in less than 15 minutes with less than 0.5% sample carryover from one well to the next. Low carryover is essential to ensure data quality in research applications.



## Emission spectra

Excitation laser line (nm)	Fluorescence channel	Fluorochromes provided by BD Biosciences			
488	Green	FITC	Alexa Fluor® 488		
	Yellow	PE	PI		
	Orange	BD Horizon™ PE-CF594	PE-Texas Red®		
	Red	7-AAD	PE-Cy™5	PerCP	PerCP-Cy™5.5
	Infrared	PE-Cy™7			
532 <sup>b</sup> or 561 <sup>b</sup>	Yellow	PE	PI		
	Orange	BD Horizon PE-CF594	PE-Texas Red®		
	Red	PE-Cy5			
	Infrared	PE-Cy7			
640	Red	APC	Alexa Fluor® 647		
	Far Red	Alexa Fluor® 700			
	Infrared	BD APC-H7	APC-Cy™7		
405	Blue	BD Horizon™ BV421	BD Horizon™ V450	BD Horizon™ VPD450	Pacific Blue™
	Green	BD Horizon™ V500	AmCyan		
	Orange	BD Horizon™ BV605			
355	Blue	Hoechst 33342			

## Maximum signal, minimum crosstalk

# An innovative and proven platform for multicolor analysis

The patented collection optics are arranged in polygon-shaped optical pathways. Their novel design efficiently maximizes signal detection and increases sensitivity and resolution. This enables researchers to identify cells with especially dim expression, or quantitate rare cell populations, by optimizing multicolor assays and panel design for best results.



### Optics system

The optics system uses a novel laser design that illuminates cells in the sample, and collection optics that direct light scatter and fluorescence signals through spectral filters to the detectors. Innovative designs for both the excitation optics and collection optics in BD LSRFortessa X-20 systems minimize light loss and optimize collection efficiency for increased sensitivity and resolution.

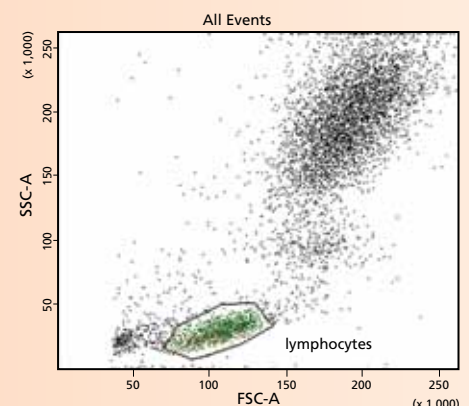
### Excitation optics

The excitation optics include a laser array which consists of multiple (up to five) fixed wavelength lasers, beam-shaping optics, and individual pinholes which together produce spatially separated beam spots.

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

### Optimal resolution of cell populations

The high sensitivity of the BD LSRFortessa X-20 allows for optimal resolution of lower expression antigens and rare cell subsets. In this example, regulatory T cells (Tregs), characterized by low levels of expression of CD127 and high levels of CD25, were easily identified. Note the resolution of different levels of expression of CD25 and CD127.

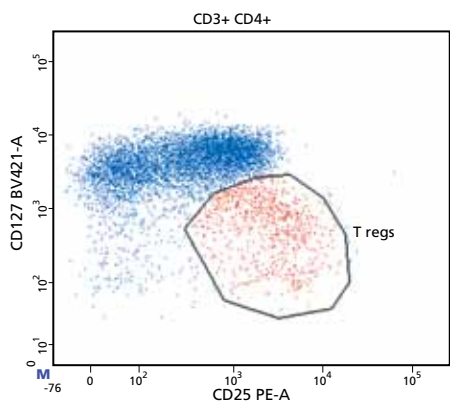
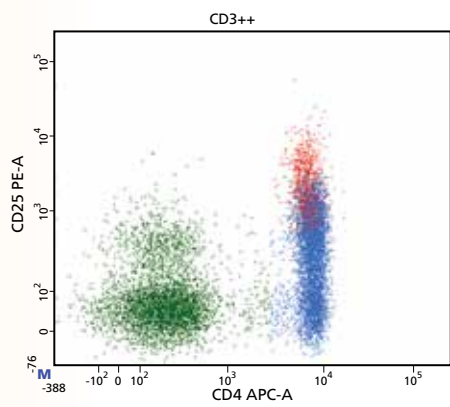
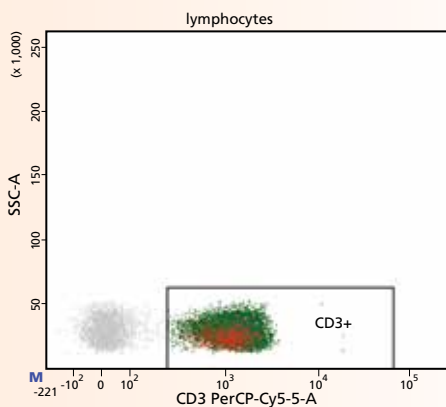




**Collection optics**

Emitted light from the gel-coupled cuvette is delivered by fiber optics to the detector arrays. The polygonal optical pathways maximize signal detection from each laser illuminated beam spot. Bandpass filters in front of each PMT collect selected fluorophore spectral wavelengths. This arrangement allows filter and mirror changes within the optical array to be made easily and requires no additional alignment.

This design efficiently exploits the principle that light reflection is more efficient than light transmission for fluorescence signal detection. 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 and higher panel multiplexing can be achieved with minimum light loss.



## Superior performance

# Unique and revolutionary designs for multicolor analysis

While improved laser and optical detection design features have been incorporated into the BD LSRFortessa X-20, the fluidics system retains the true fixed-alignment flow cell design. The flow cell is gel-coupled to the collection optics to maximize detector signal.



### Fluidics system

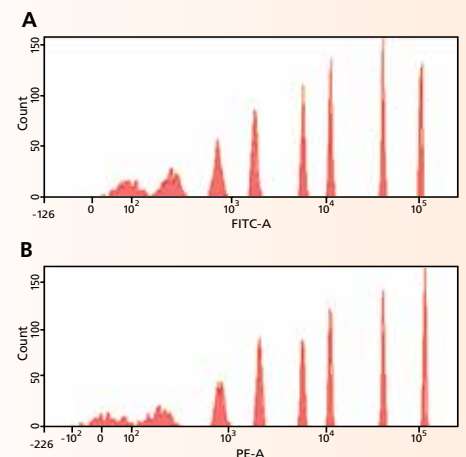
The fluidics system is pressure driven. Hydrodynamic focusing forces sample cells through the cuvette flow cell, where they are interrogated. The flow cell is in fixed alignment with the laser and gel-coupled to the collection optics. This design ensures that the laser is precisely focused on the sample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

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

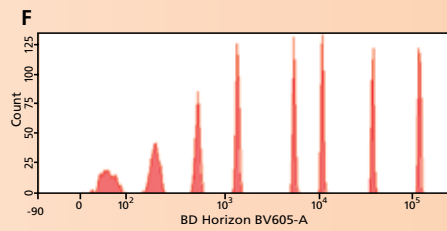
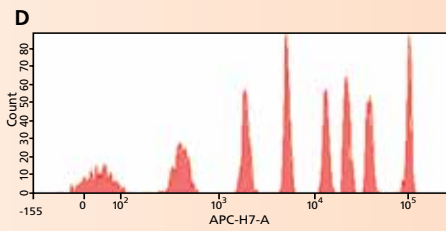
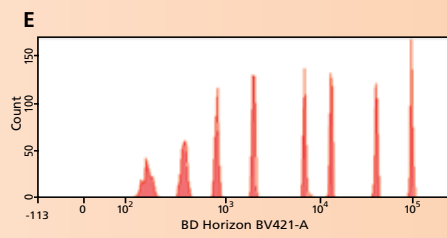
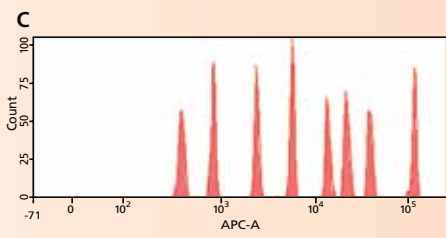
Fluidics sensors maintain constant pressure, while a fluidics monitoring system warns when sheath fluid is low or empty, or when the waste container is full.

### Characterization of instrument sensitivity using 8-peak beads

The sensitivity across detectors of a BD LSRFortessa X-20 equipped with blue (50-mW), red (100-mW), and violet (50-mW) lasers is illustrated by the optimal resolution of SPHERO™ Rainbow 8-peak beads. Note that all peaks are easily identified in various detectors from the blue (A,B), red (C,D), or violet (E,F) lasers.







## Greater consistency

# Automated controls for setup, acquisition, and analysis

BD FACSDiva™ software controls the efficient setup, acquisition, and analysis of flow cytometry data from the BD LSRFortessa X-20 workstation. The software is common across BD FACST™ instrument platforms, including the BD FACSCanto™ cell analyzer and BD FACSAria™ cell sorter systems. This affords researchers greater application flexibility, allowing them to easily move assays from one platform to another.



BD LSRFortessa X-20 front panel

## Cytometer setup and tracking

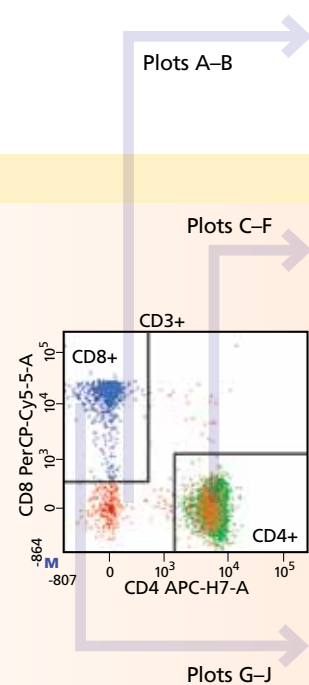
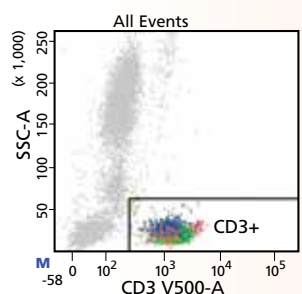
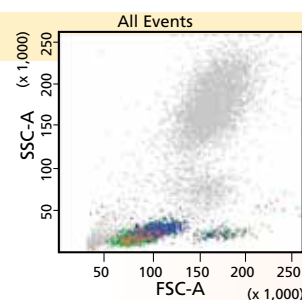
The BD™ Cytometer Setup and Tracking (CS&T) feature of BD FACSDiva software establishes baseline settings and adjusts for instrument variability. The software reduces operator error, and ensures consistency of results by setting the signal time delay across the multiple laser beams and optimizing PMT voltages. Application-specific settings can also be specified, allowing for rapid setup and performance of routine experiments in a more consistent manner. QC tracking capabilities in the software measure instrument settings and report on performance. Levey-Jennings plots help users understand instrument performance and identify maintenance issues.

## Acquisition and analysis

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

## Analysis of human T-cell subsets

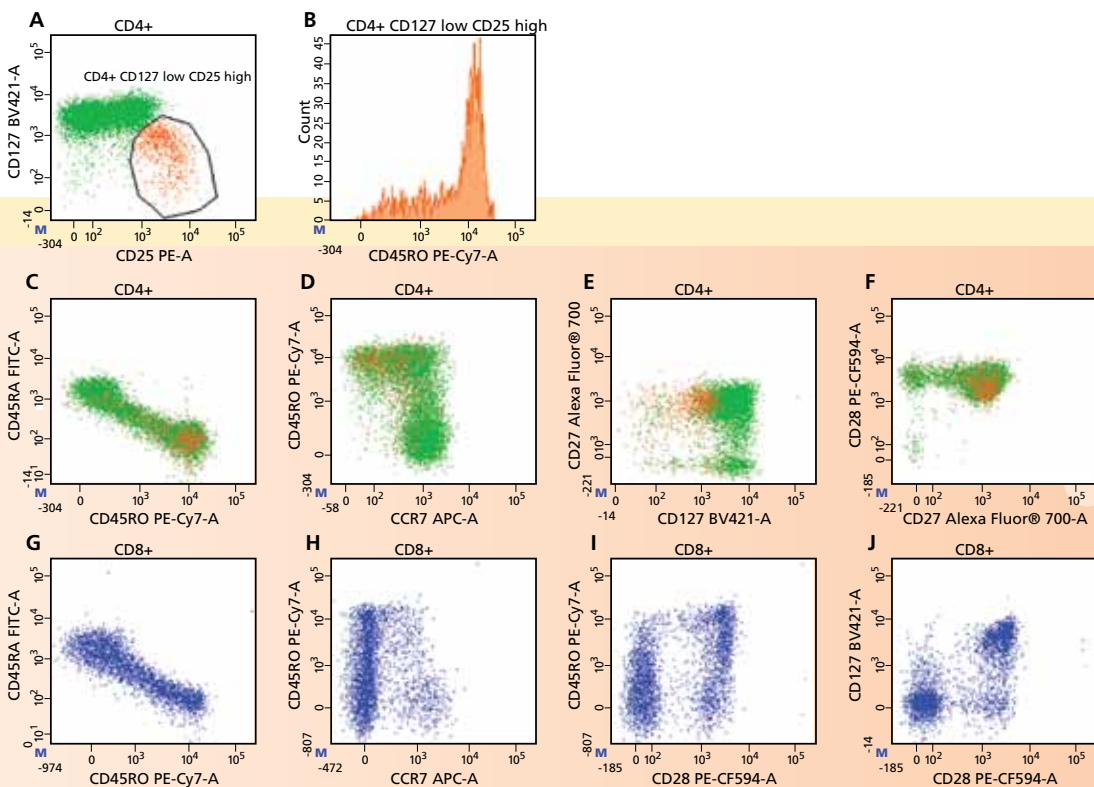
Data shows a 10-color panel run on a 3-laser BD LSRFortessa X-20 with a blue/red/violet configuration. The panel was used for defining various subsets of regulatory T cells (A, B), memory/effector CD4<sup>+</sup> T cells (C, D, E, F), and memory/effector CD8<sup>+</sup> T cells (G, H, I, J).





For analysis, the software includes powerful features such as hierarchical snap-to gating, a variety of plot formats, and batch analysis. Recorded data can be analyzed by creating plots, gates, population hierarchies, and statistics 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 include user-defined batch analysis and automated features such as gate resizing, pausing between data files, exporting statistics, and printing before proceeding to the next data file.



Choice now and in the future

# Special order products for unique needs



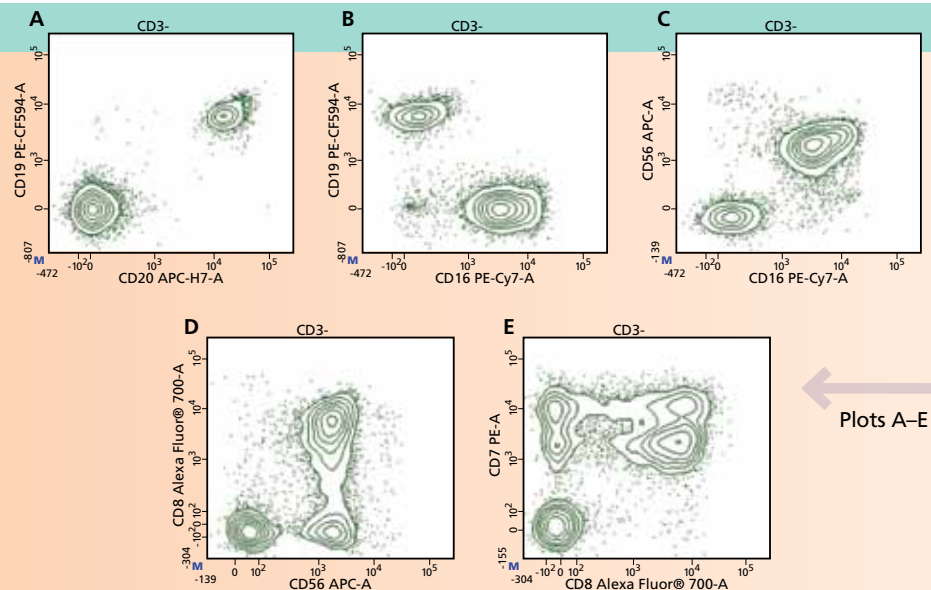
The innovative special order program is tailored to meet the special needs of research at the leading edge of biomedical discovery, and offers a wide range of choices to help researchers create the ultimate customized instrument for their requirements.

### Multiple power options

Innovative laser options include the choice of solid-state lasers across the full spectrum. Currently, a menu of 18 laser wavelength options is offered, ranging from the complete spectrum of ultraviolet to infrared wavelengths. Through the special order program, researchers can configure a BD LSRFortessa X-20 with up to 5 lasers and 20 positional choices for the detectors. In addition to laser wavelength, the special order program offers multiple laser power options and filter selections to better optimize assay needs.

### Analysis of human lymphocyte subsets

Data shows a 10-color panel run on a 3-laser BD LSRFortessa X-20 with a blue/red/violet configuration. The panel was used for defining various lymphocyte T-cell subsets (A–E, this page) and non-T-cell subsets (F–J, opposite page) using lysed whole blood (BD FACSTM lysing solution) from a normal donor.



# CONFIGURATION

Cuvette flow cell

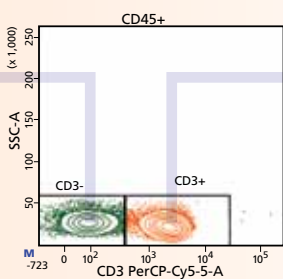
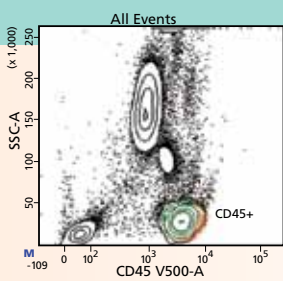
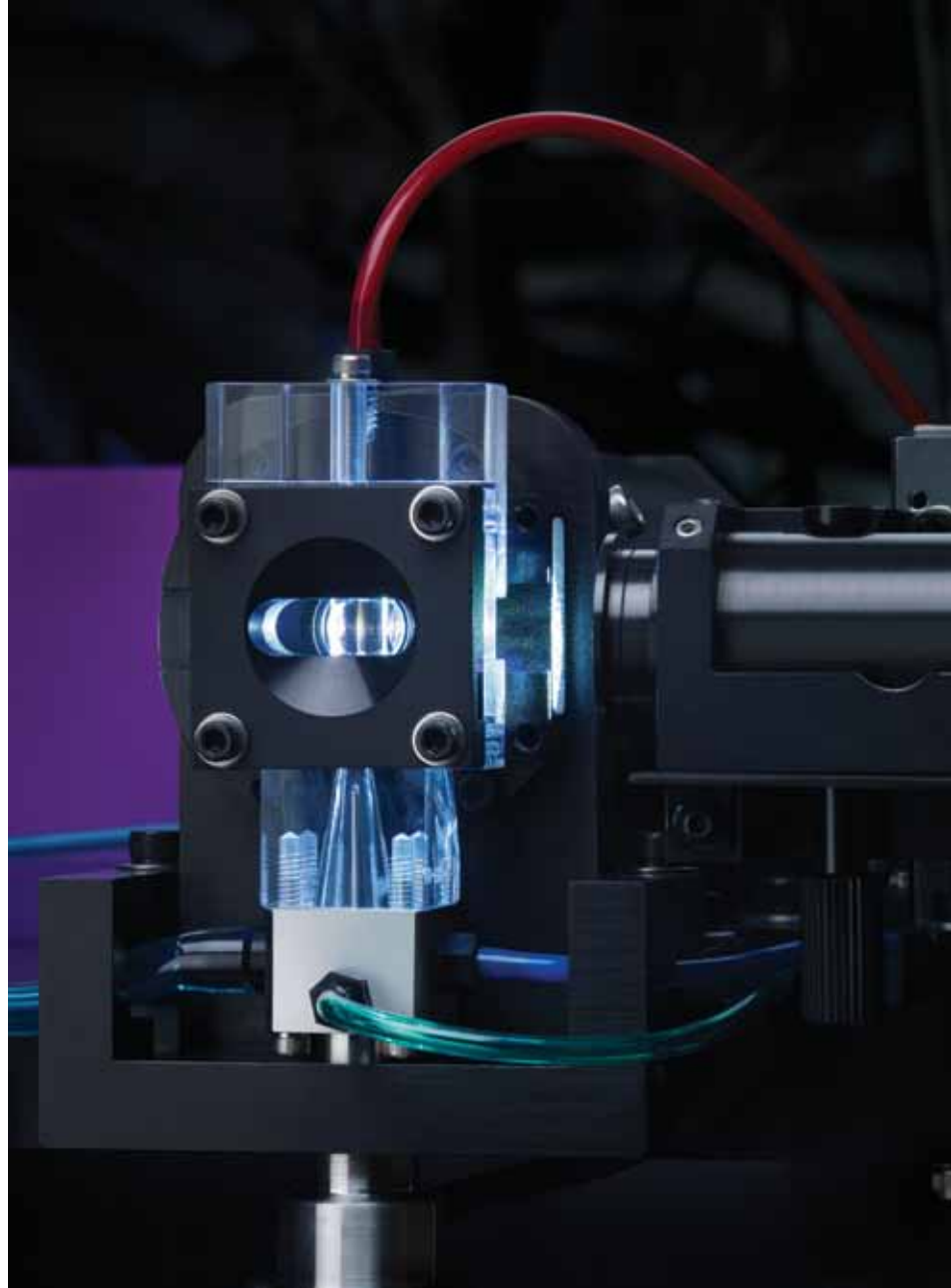
## Evolving capabilities

The BD special order program allows customers to add lasers after their initial system purchase, to meet new or evolving requirements. This wide range of choice and flexibility makes the special order BD LSRFortessa X-20 a solid, long term investment.

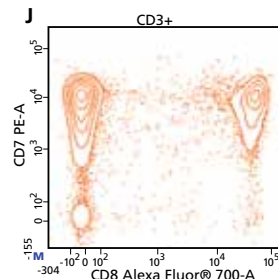
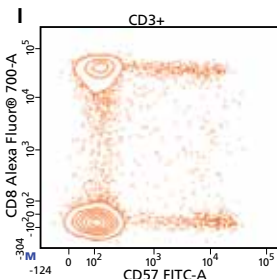
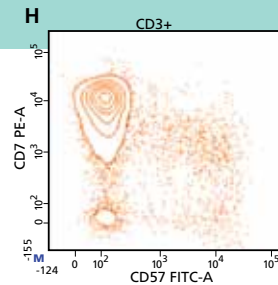
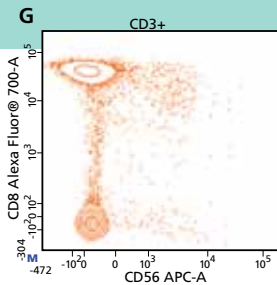
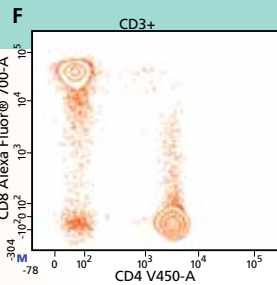
## An innovation process

The vigorous sourcing of the latest and best laser technologies ensures an unparalleled range of configuration choices offered by the BD special order program for BD™ LSR analyzers. New technologies are regularly incorporated into the product line as soon as they become available.

The ever-expanding list of available lasers demonstrates BD's ongoing commitment to perpetual innovation. This is one of the many ways BD ensures that the BD LSR analyzer platform continues to support the evolving needs of leading researchers around the world.



Plots F-J



## Services

BD Biosciences is fully committed to the success and satisfaction of its customers. Supporting flow cytometry applications for over 35 years, BD has training, technical application support, and field service teams 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 with your BD LSRFortessa X-20 product installation, future upgrades, and application support.

### **Training**

Hands-on training is included with each special order BD LSRFortessa X-20 analyzer. 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 LSRFortessa X-20 analyzer.

### **Technical application support**

BD technical application 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 instrument and application support.

### **Field service**

When instrument installation or service is required, a BD Technical Field Service Engineer can be dispatched to the customer site. BD field service engineers are located across the world. On-site service and maintenance agreements are available to provide long-term support for BD LSRFortessa X-20 analyzers.

### **Special order program**

Instruments can be customized to meet customer requirements via the special order program.



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Class 1 Laser Product.

APC-Cy™7: US Patent 5,714,386

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