



CYTEK®
TRANSCEND THE CONVENTIONAL



Cytek Borealis™ Flow Cytometer

A New Dimension Of Single-Cell Insight

Introducing The Cytex Borealis Flow Cytometer

Cytex Biosciences continues to advance the field of flow cytometry with its proven Full Spectrum Profiling™ (FSP®) technology, trusted worldwide and supported by thousands of instruments installed globally and over 3,900 peer-reviewed publications. Cytex continues to empower researchers to scale confidently from routine assays to high-parameter discovery by overcoming the limitations of conventional flow cytometry.

Building on this foundation, the Cytex Borealis system extends the power of FSP technology by expanding detection into novel spectral regions with the Deep Ultraviolet (DUV) and Infrared (IR) lasers. This increases flexibility in marker assignment within high parameter panels avoiding spectral crowding and preserving resolution as panels scale, enabling deeper and more nuanced biological insights. With exceptional resolution, increased multiplexing capacity, walkaway automation, and high-throughput capabilities, the Cytex Borealis system empowers scientists to focus on what matters most: generating high-quality data and accelerating discovery.

New Features:



Up to 110 high-efficiency fluorescence detectors designed to deliver high-resolution performance and support deeper cellular characterization



Designed for laboratory efficiency, with integrated automated sample loading, temperature-controlled sample handling, and automated startup and shutdown



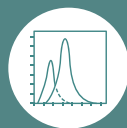
Expanded spectral capability with the addition of DUV and IR lasers, enabling up to seven on-board excitation wavelengths



High-throughput acquisition with high-resolution performance, supporting flow rates up to 200 $\mu\text{L}/\text{min}$



Side scatter (SSC) detection available on each on-board laser. Additional highly sensitive side scatter detectors on the Blue and Violet lasers support small particle analysis



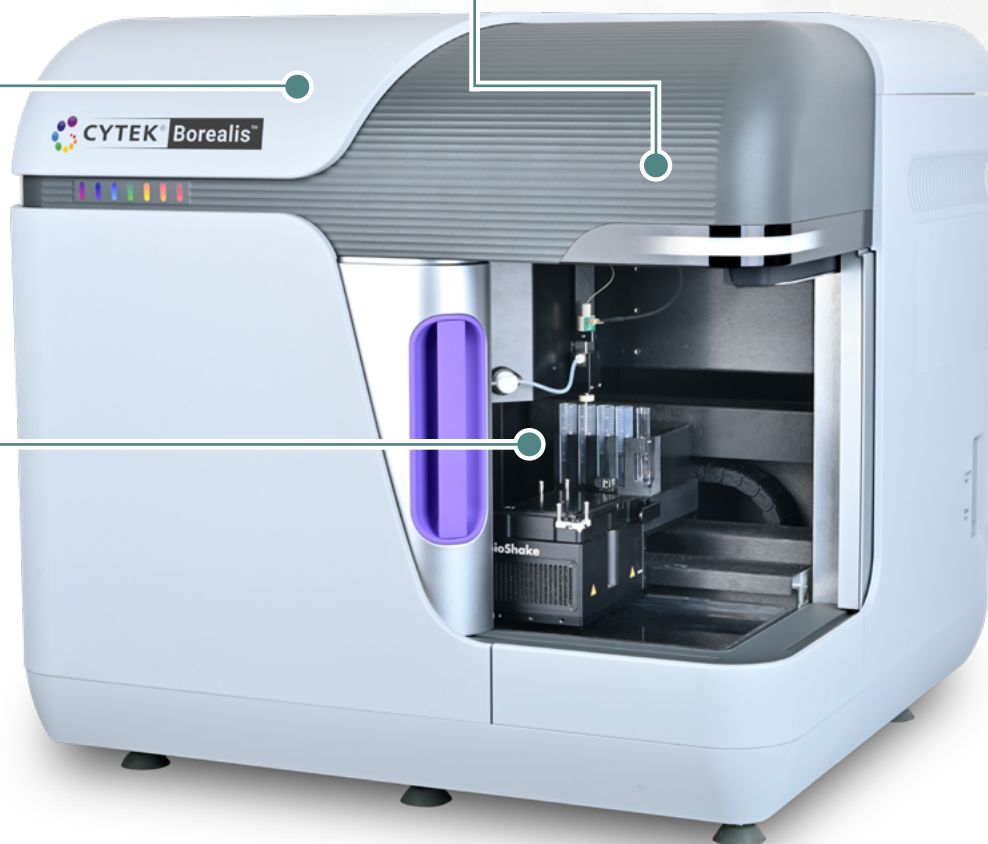
Improved small particle detection with a new high-resolution mode designed to enhance sensitivity alongside highly sensitive Blue and Violet SSC detectors

Electronics

- Low noise electronics improves resolution of dim signals

Optics

- Expanded spectral capability with the addition of the DUV (320 nm) and IR (850 nm) lasers
- Flat-top excitation optics ensure consistent performance across all flow rates



Loader

- Integrated sample loader with temperature control from 4-37°C and is compatible with 40-tube racks, 96-well plates, and 96-well deep well plates
- Automated startup and shutdown help simplify daily operations by reducing need for manual intervention



SpectroFlo® Software

- Separate acquisition modes supporting both conventional and spectral workflows within a single platform
- Guided workflows to detect and extract single or multiple autofluorescence signatures

New Cytex cFluor® Reagents For DUV And IR Lasers

The Cytex Borealis system is introduced alongside a new portfolio of DUV and IR fluorochromes and supporting reagents, providing an integrated solution for accessing spectral space and scaling panel complexity with confidence. These new early access dyes are now available for custom development, evaluation, and early adoption with broader commercial availability planned.

Figure 1

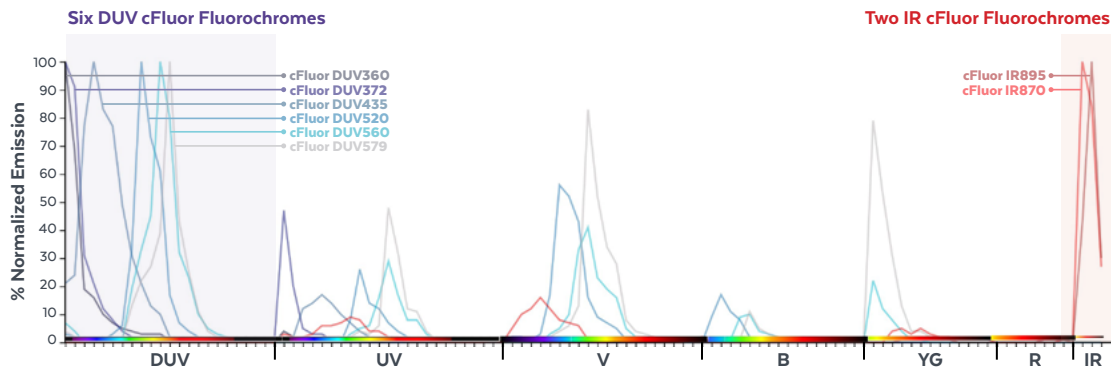


Figure 1: Normalized spectral signatures of eight early access cFluor DUV and IR fluorochromes obtained on the Cytex Full Spectrum Viewer.

Biology Deep Dive: 55-Color Panel

The Cytex Borealis system 55-color panel provides a proven foundation for high-parameter flow cytometry. Expanded DUV and IR laser capability enables incorporation of additional cFluor dyes optimized for these excitation lines, opening new paths for panel design and marker selection. The result is a broader panel that maintains the spectral resolution and performance expected from the Cytex platform.

55-Color Panel For Detailed Immunophenotyping Of Human Lymphoid And Myeloid Subsets					
Laser	Marker	Fluorochrome	Laser	Marker	Fluorochrome
DUV (320 nm)	CD57	cFluor DUV372	B (488 nm)	CD335 (NKP46)	VioBright B515
	CD14	cFluor DUV435		CD73	cFluor B532
	CD19	cFluor DUV520		CD15	cFluor B548
	CD4	cFluor DUV560		CD2	PerCP-Cy5.5
	CD123	cFluor DUV579		CD95	RB575
UV (355 nm)	CD45RA	cFluor UV395		CD337 (NKP30)	RB613
	CD16	BUV496		CD137 (4-1BB)	RB670
	Viability	Live/Dead Blue		CD159a (NKG2A)	PerCP-Vio700
	PDL1	SBUV540		CD25	RB744
	TCRva24-Ja18	BUV563		CD226 (DNAM-1)	RB780
	CD314 (NKG2D)	BUV615		KLRG1	RB824
	CD39	BUV661	YG (561 nm)	GPR56	PE
	CD69	BUV737		CD56	cFluor YG584
	CD11c	BUV805		CD24	cFluor YG610
	PD-1	BV421		CD194 (CCR4)	cFluor BYG610
V (405 nm)	CD366 (TIM-3)	cFluor V435		CD183 (CXCR3)	cFluor BYG667
	TCRvd2	Pacific Blue		TCRgd	cFluor BYG710
	CD159c (NKG2C)	BV480		CD294 (CRTH2)	cFluor BYG750
	TCRva7.2	BV510		CD196 (CCR6)	cFluor BYG781
	CD45	V547		CD94 (DX22)	PE/Fire 810
	IgM	BV570	R (640 nm)	CCR10	cFluor R659
	CD185 (CXCR5)	cFluor V605		CD127	Alexa Fluor 647
	CD28	cFluor V670		CD197 (CCR7)	cFluor R685
	HLA-DR	cFluor V715		TIGIT	cFluor R720
	CD11b	BV750		IgD	cFluor R745
	CD161 (KLRB1)	cFluor V780		CD38	cFluor R780
	CD8	BV828		CD27	cFluor R840
			IR (850 nm)	CD3	cFluor IR870
				CD20	cFluor IR895

Figure 2A

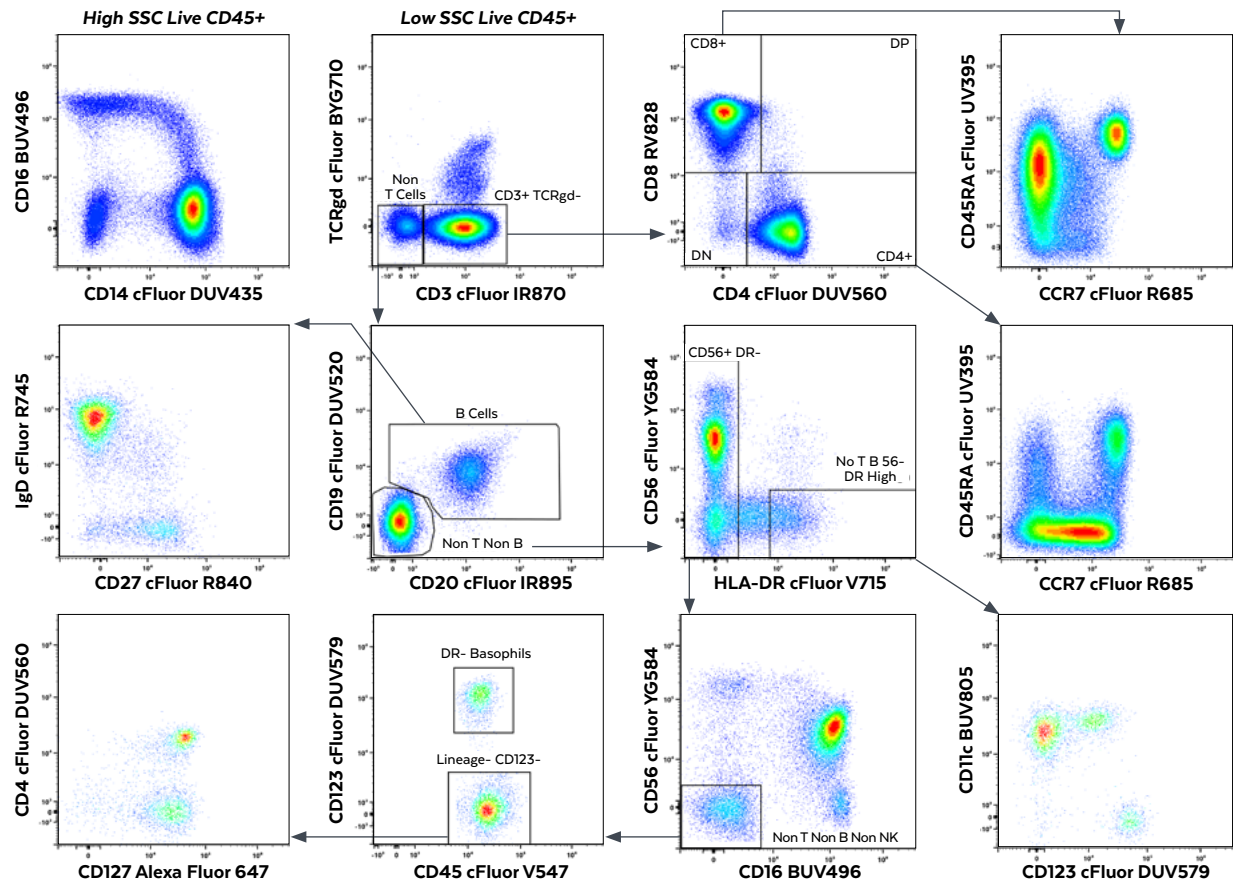


Figure 2B

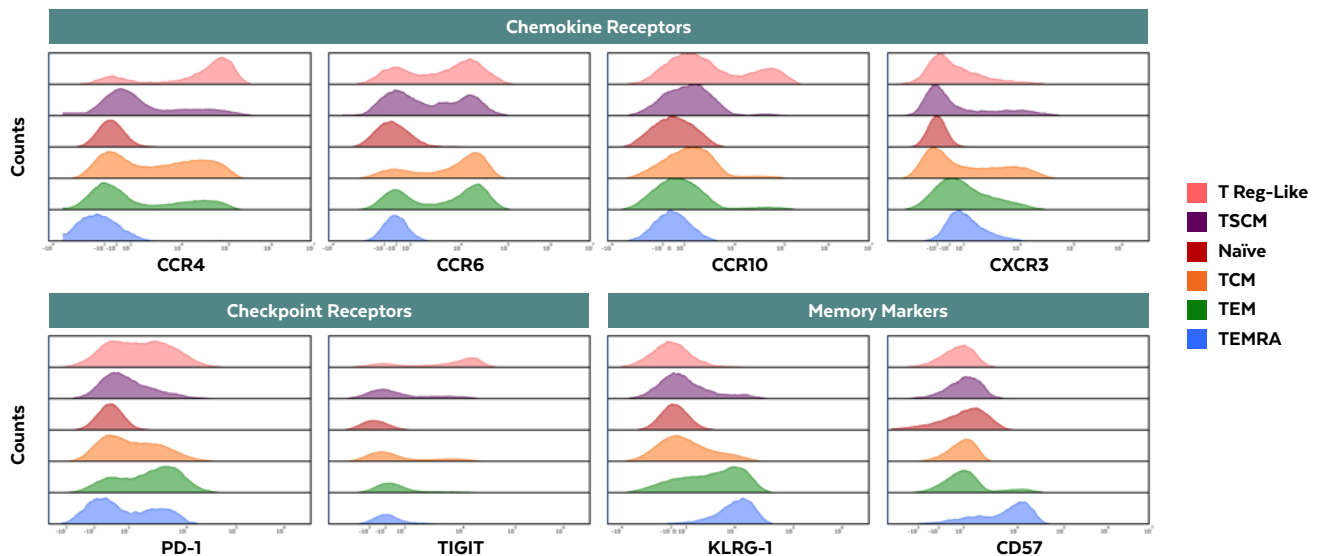


Figure 2: 55-color panel for detailed immunophenotyping of human lymphoid and myeloid subsets. **A)** Manual gating reveals optimal main lineage populations identified with DUV or IR cFluors. Cell doublets, dead cells, and aggregates were excluded (not shown). Live CD45⁺ cells were then segregated into low and high SSC. In the high SSC population, monocytes were identified based on CD14 and CD16 expression. From the SSC low gate, the following populations were identified: T cells, B cells, NK cells, NKT-like cells, ILCs, basophils, and dendritic cells (DCs). **B)** Overlaid histograms show the expressions of selected chemokine and checkpoint receptors, as well as memory markers in six subsets of CD4⁺ T cells defined by the expression of CCR7 and/or CD45RA, as follows: TSCM, T stem cell memory; naïve; TCM, T central memory; TEM, T effector memory; and TEMRA, CD45RA-expressing T effector memory. T reg-like CD4⁺ T cells (CD25⁺ CD127⁻) are also shown.

Figure 2C

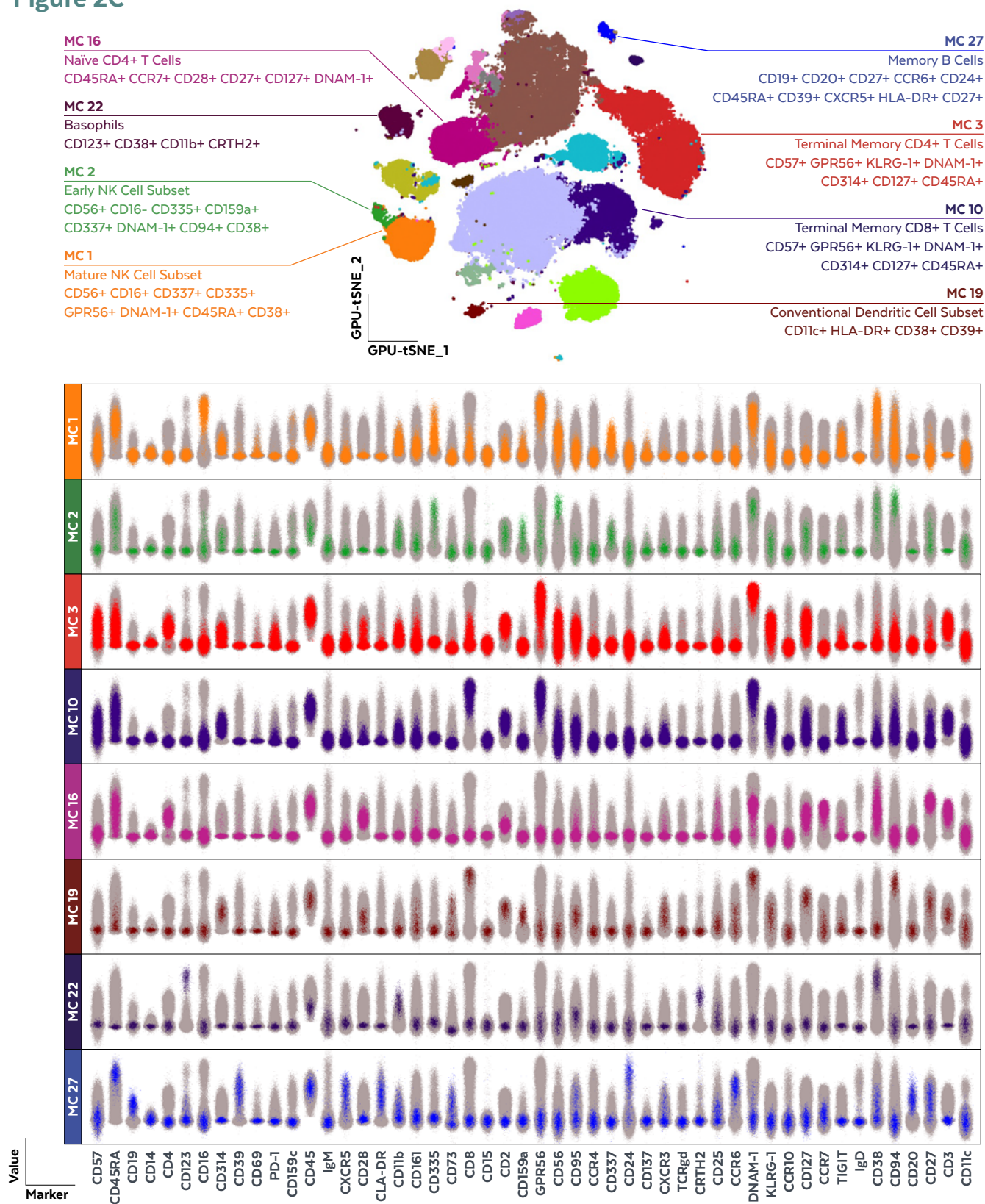


Figure 2: C) Metacluster (MC) analysis was performed using FlowSOM and visualized with a GPU-accelerated implementation of t-distributed Stochastic Neighbor Embedding (GPU-tSNE) plot. Analysis of live low-SSC CD45+ cells demonstrates marker expression and cluster identity across multiple cell subsets, including T cells, B cells, NK cells, DCs, or basophils. Eight MCs are shown to highlight the panel capability to distinguish subpopulations within each cell subset identified. MC identity was verified in scatterplots showing marker expression for the eight selected subpopulations.

Cross-Platform Assay Reproducibility

Outstanding population resolution is a hallmark of Cytek instrumentation. Across Cytek platforms, consistency in fluorescence performance is achieved with a patented optical design and implementation of tight specifications across all components and procedures during the manufacturing process. To standardize instrument setup, Cytek uses pre-optimized acquisition settings known as CytekAssaySetting (CAS) and an automated Daily QC procedure.

Figure 3

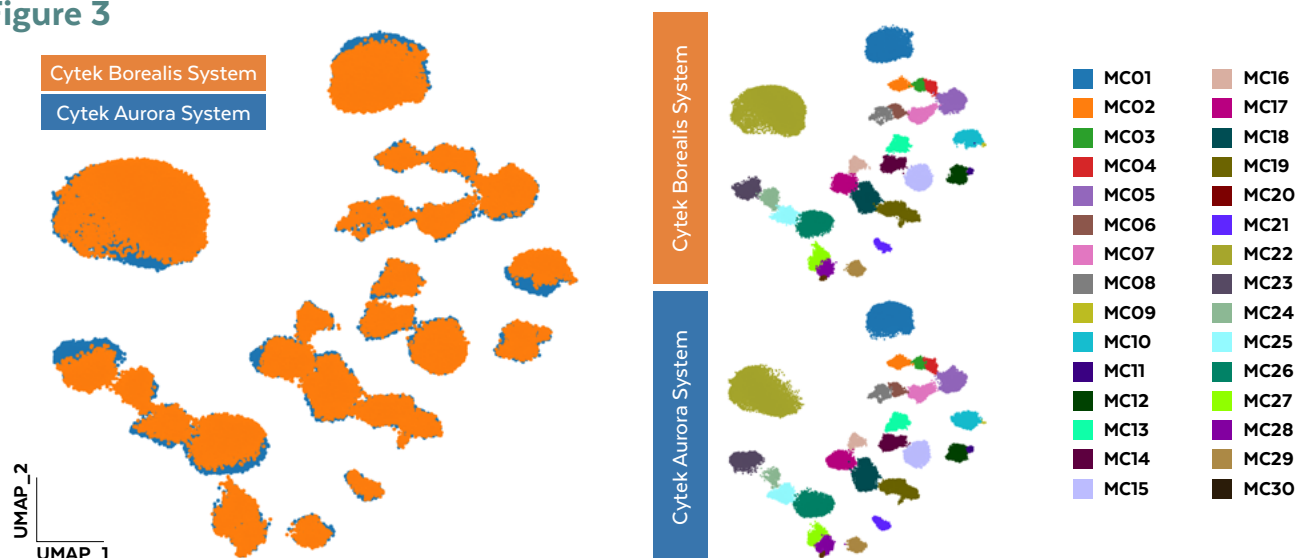


Figure 3: Equivalent resolution and cluster identity in the 30 MCs identified in CD8+ T cells when comparing a published 45-color panel in each platform. PBMCs were stained following the protocol described in the OMIP-109 publication. Samples were acquired at CAS. Complexity Indices (condition numbers): 38.94 in the Cytek Borealis system and 51.33 in the Cytek Aurora™ system. MC analysis was performed with FlowSOM and visualized on UMAP plots. 60,000 CD8+ T cells were used per sample.

Full-Plate Confidence For Spectral Flow Cytometry

The Cytek Borealis system enhances laboratory automation, allowing researchers to focus on data interpretation rather than manual processes. Its integrated loader supports flexible sample acquisition from standard 96-well plates, 96-well deep well plates, and 5 mL tube racks, while a 4°C temperature-controlled stage preserves sample integrity. Flexible operating modes accommodate both low carryover and high-throughput workflows.

Advanced Small Particle Detection

The Cytex Borealis system expands small particle analysis with a large dynamic range of side scatter resolution supported by multiple SSC detectors for the Blue and Violet laser. In standard fluidics mode, the system is capable of resolving polystyrene beads down to 50 nm, enabling sensitive detection of very small particles. This performance supports advanced applications involving identification of extracellular vesicles, nanoparticles, viruses, bacteria, and other subcellular components.

Early Access Program (EAP)

This new system is available now through the EAP. Designed for experienced flow cytometry users, the EAP was developed for collaborative evaluation of the expanded spectral capability, new DUV and IR dyes, and applications that would leverage the Cytex Borealis system.

Users involved will:

- Collaborate directly with Cytex R&D and Applications teams during the early access phase
- Gain early access to the DUV and IR cFluor reagents, designed to take advantage of the Cytex Borealis system optical configuration
- Provide feedback on usability, reagent performance, and desired workflow and software capabilities
- Participate in collaboration opportunities, including application data generation, testimonials, conference presentations, publications, or co-authored scientific content where appropriate

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This document highlights preliminary data, final performance and specifications will be confirmed upon completion of verification testing.

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