microDAWN

The only multi-angle light scattering detector uniquely designed for UHPLC with superb sensitivity

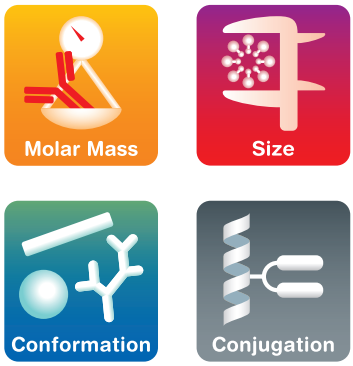
WYATT TECHNOLOGY

microDAWN™

Absolute molar mass and size for UHPLC

The microDAWN brings all the benefits of multi-angle light scattering (MALS) analysis to ultra-high-performance liquid chromatography (UHPLC). Combine a microDAWN with any UHPLC system, a size exclusion column and the microOptilab™ refractive index detector for a complete SEC-MALS system to characterize proteins and polymers for:

- Solution properties of macromolecules
- Molar mass, independent of elution time
- Molecular size
- Conjugation
- Conformation
- Oligomeric state

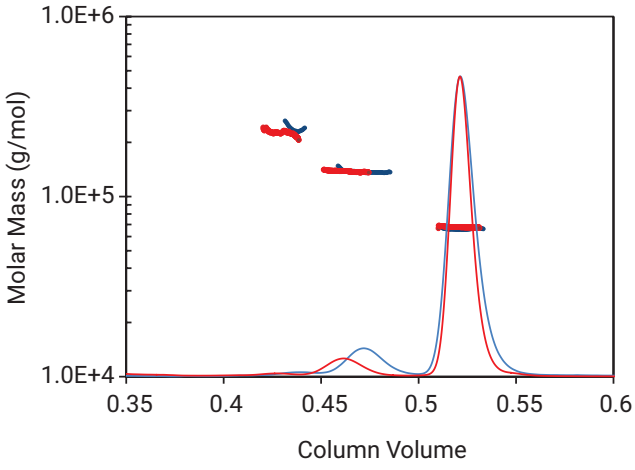


Maximize confidence

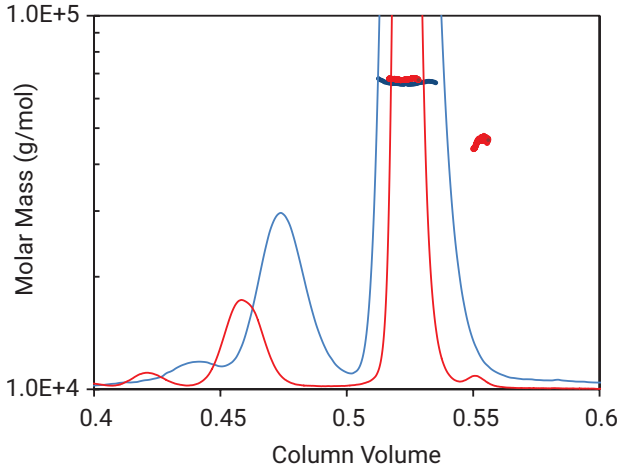
MALS eliminates the uncertainties of column calibration, molecular standards and non-ideal column interactions. Even composite molecules such as glycoproteins and co-polymers are amenable to accurate analysis. MALS affords extra-high sensitivity to aggregates.

Minimize consumption

UHPLC affords many benefits such as short run times, dramatically reduced consumption of sample and solvent, and improved separation. Standard light scattering instrumentation is not suitable for UHPLC's ultra-narrow peaks. The microDAWN and microOptilab maintain the high resolution and low dispersion necessary for high-quality data with such small sample quantities.



Molar masses of a protein monomer, dimer, and trimer, determined by SEC-MALS on UHPLC (red) and standard SEC-MALS (blue), showing identical results. Separation by 15 cm BEH-200 column (Waters).



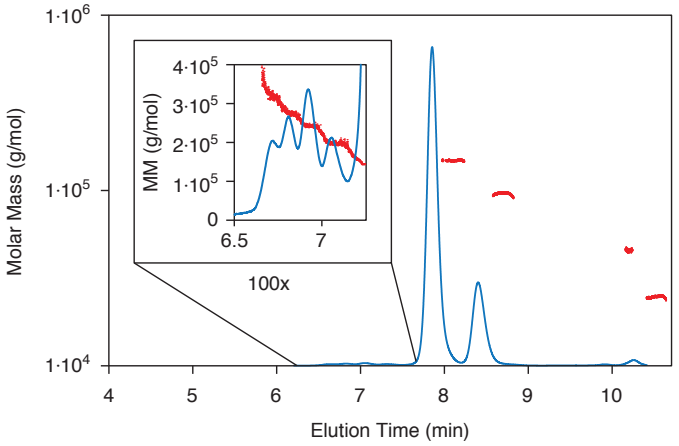
UHPLC and HPLC light scattering chromatograms of the same protein analyzed to the left. Here UHPLC was run on a 30 cm BEH-200 column (Waters), revealing a fragment peak that was not discernable on HPLC or a 15 cm UHPLC column.

Increase productivity

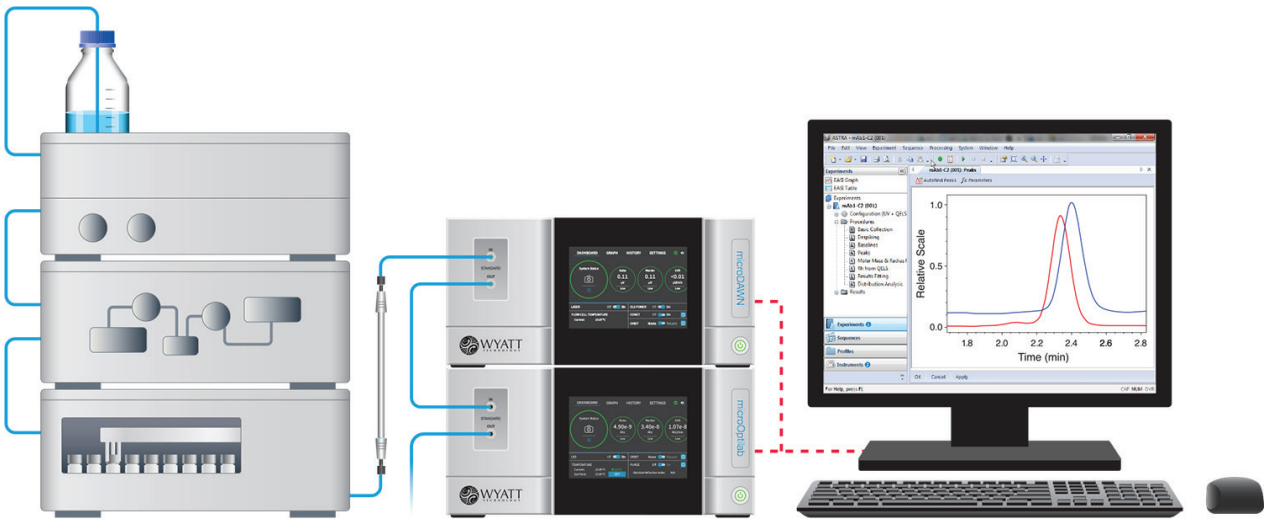
- Every microDAWN instrument includes a COMET™ ultrasonic cell cleaner for automated clean cycles.
- Add a WyattQELS™ dynamic light scattering module to measure sizes below 10 nm in radius.
- Combine standard and advanced SEC-MALS analyses with UHPLC's higher throughput.

Endorsed by the scientific community

No instrument can compare to the DAWN family of MALS detectors for the characterization of proteins and macromolecules in solution. Our bibliography of thousands of peer-reviewed papers using DAWN®, miniDAWN® and microDAWN MALS instruments proves the power of the microDAWN to provide molecular weight and size data that scientists around the world depend on for their daily research.



The power of UHPLC for separating aggregates and fragments combines with MALS to unequivocally identify small quantities of impurities in an IgG sample. Each of the aggregate peaks shown in the 100x inset represent a fraction of one percent of the monomer total mass yet is well-quantified by SEC-MALS on UHPLC.



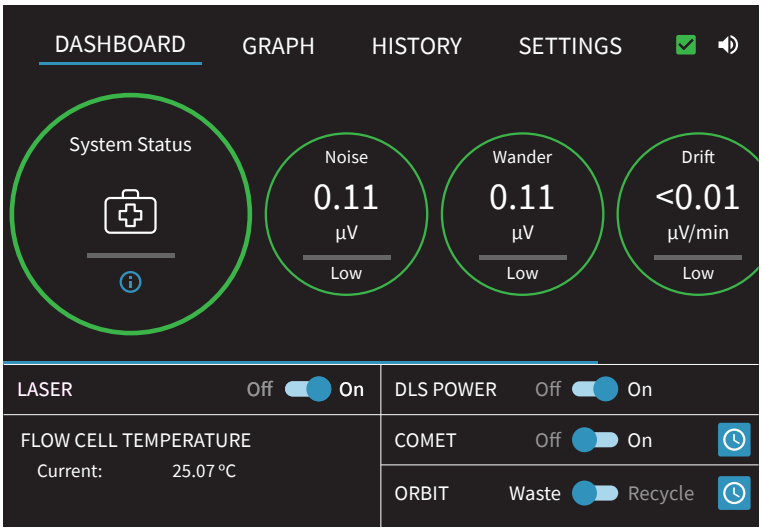
The microDAWN and microOptilab interface with any UPLC or UHPLC system.

New User Interface

The larger responsive display is the starting point of our Smart Services™ platform and designed to give the user a simple to use, all-in-one system view

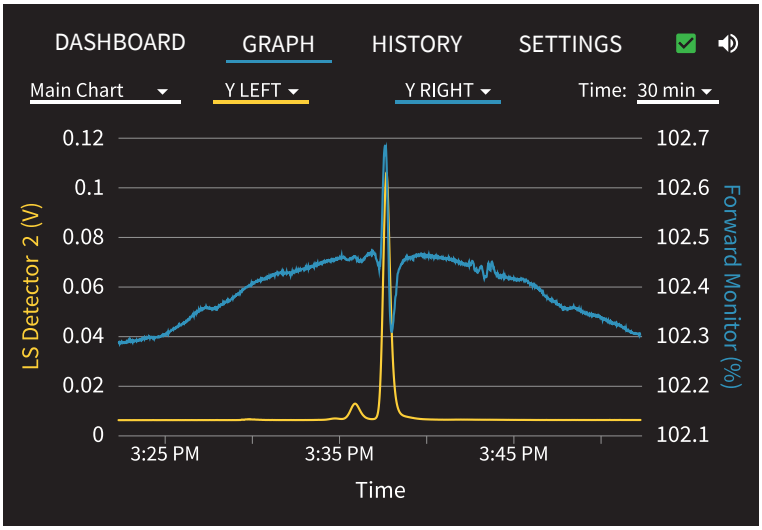
Customizable User Preferences

SEC-MALS System Readiness Monitor



Real-time Instrument Health Indicators

System Control Panel



Customizable Graphing

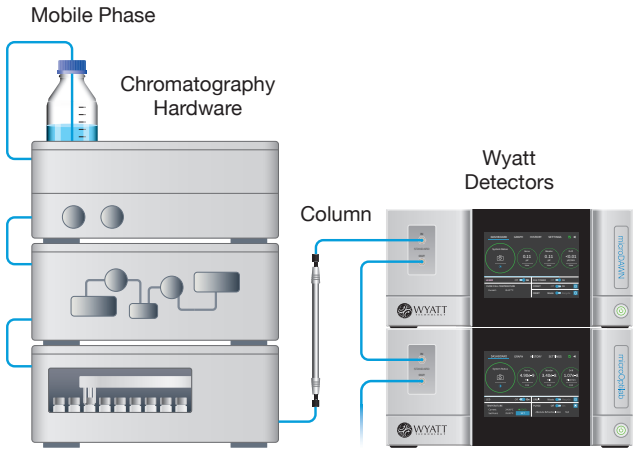
Zoom, Pinch, Swipe Functionality

Smart Services Platform

A series of user experience enhancements delivering greater ease-of-use and improved workflow

System Ready Monitor

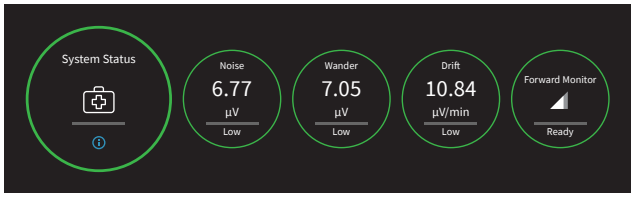
Never waste a run due to incomplete equilibration, excessive mobile-phase noise or sub-optimal detector state. The System Ready Monitor simply does that for you and continuously reports if all systems are optimal right from the front panel. If problems do arise, the System Ready Monitor alerts you by changing from green to yellow to red depending on the severity and provides actionable, real-time guidance on what needs to be done to bring the system back to peak health.



Real-Time Health Indicators

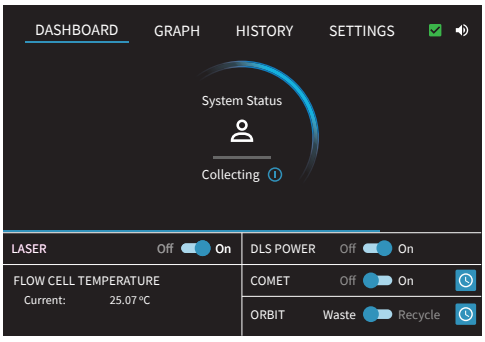
System Ready Monitor indicating that not all is well? For more detailed information on what's holding you back, review the Real-Time Health indicators. Perhaps the Forward Monitor indicator is triggered by a bubble or the Drift indicator by insufficient column equilibration.

Specific indicators can be customized for more or less stringent requirements. For example, the Noise indicator can be set to have a wider acceptable range for aqueous buffers, which typically exhibit more noise than organic solvents.



Collection Mode

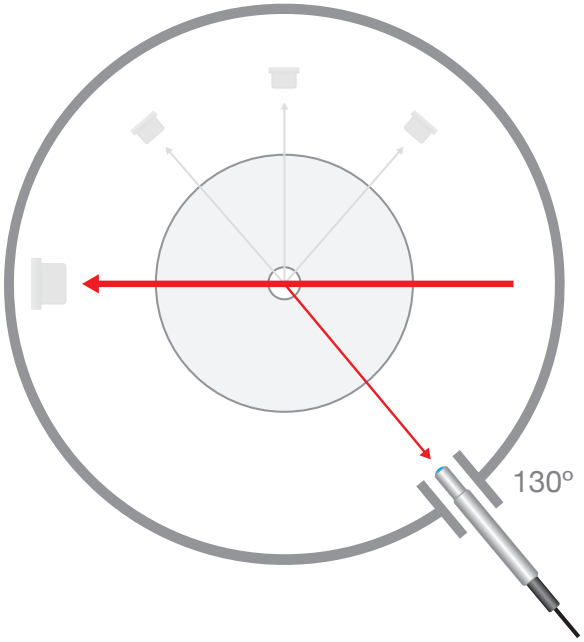
Never again worry about a colleague disrupting your experiments. Our dynamic Collection Mode indicator provides a spinning, system status wheel right from the front panel that can't be missed. Want to know whose is operating the instrument? Simply click on the collection icon to determine who is logged in and from what computer they are connected.



WyattQELS – Inline DLS

A unique benefit of Wyatt MALS instruments is their ability to accept an optional embedded dynamic light scattering (DLS) module for inline measurements of hydrodynamic radius. The WyattQELS connects via optical fiber to the microDAWN flow cell and collects light scattered from particles in the beam, simultaneously with MALS acquisition.

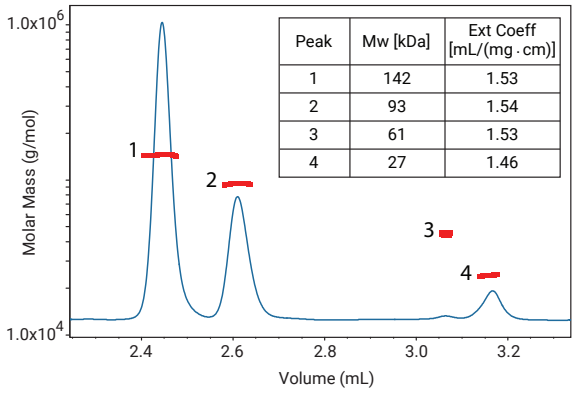
For the microDAWN, the fiber is placed at 130° to optimize maximal size range along with minimal stray light.



CheckPlus™

If concerns about the status of your instrument arise, an expert opinion is just a click away. With CheckPlus, our integrated service application, a complete instrument and system history report can be auto-generated at any time and sent to a Wyatt Service Engineer or Application Scientist for further analysis. This is just another example of how our Smart Services Platform is designed to deliver important customer-facing benefits and simplified use.

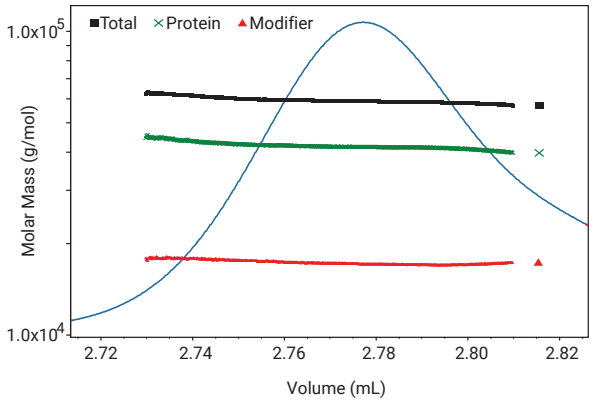
Identification of protein degradation products



Peak	Mw [kDa]	Ext Coeff [mL/(mg · cm)]
1	142	1.53
2	93	1.54
3	61	1.53
4	27	1.46

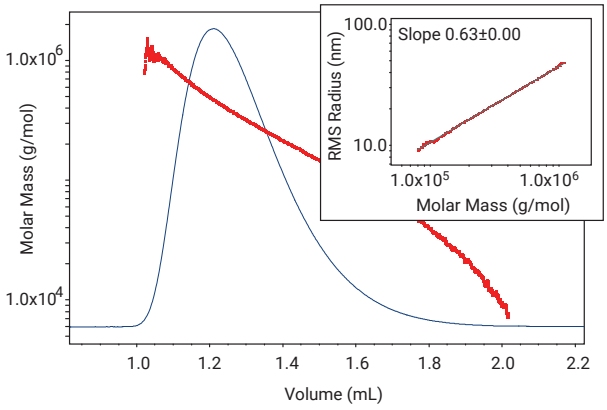
IgG and its fragments were identified and quantitated by MALS using a Waters® Acquity® UPLC® system with a BEH-200 column, microDAWN and microOptilab. Mobile phase was phosphate-buffered saline at pH 7.4. Since the extinction coefficients are nominally unknown, molar masses of the protein fragments could only be determined by MALS with dRI concentration measurements. Simultaneously the extinction coefficients were determined by comparing UV and dRI peak areas. The combination of molecular weight and extinction coefficient helps confirm the identity of peaks 2, 3 and 4 as IgG fragments.

Protein conjugate analysis



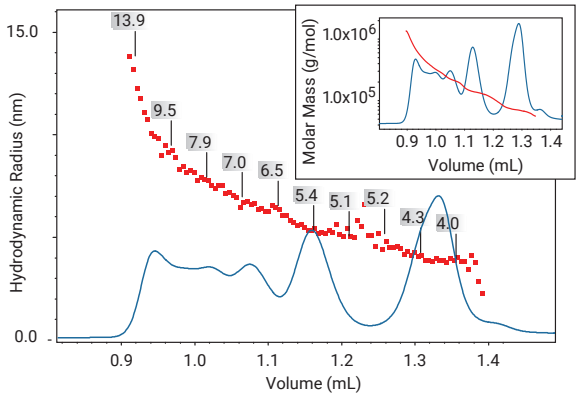
The combination of UV, MALS and dRI may be used to analyze the composition of protein-carbohydrate conjugates, surfactant-enveloped membrane proteins and co-polymers. Here SEC-MALS, using a Waters Acquity UPLC system with a BEH-200 column, microDAWN and microOptilab, analyzed a glycoprotein to determine the molar mass of the protein and total glycan molecular weight, as well as the overall molecular weight of the complex.

Polymer molecular weight and size



MALS provides first-principles determination of absolute molecular weight and size for the most reliable characterization of polymers. Here SEC-MALS, using a Waters Acquity UPLC system with APC XT 900 and XT 450 columns in series with microDAWN and microOptilab were used to analyze a polystyrene reference sample, NIST 706a. The heterogeneity of this sample is evident in the sloping molecular weight distribution across the peak. The inset shows a conformation plot obtained by mapping the root mean square radius vs. molar mass. The slope of the plot indicates that this polymer is in fact a linear, random coil.

Hydrodynamic size of proteins and aggregates



While MALS cannot measure the size of molecules smaller than 10 nm in radius, with the addition of a WyattQELS embedded dynamic light scattering module, the microDAWN can determine size (as well as molar mass) of smaller molecules. Here a stressed protein was analyzed to assess both hydrodynamic radius R_h and molecular weight M_w of the monomer, low oligomers and larger soluble aggregates. Sample was bovine serum albumin prepared in 10 M urea and subsequently dialyzed to phosphate-buffered saline, pH 7.4. Inset show molar mass distribution as determined by SEC-MALS. Dimer, trimer and tetramer peaks are clearly separated and identified by M_w.

Specifications

Measurements	
Molar Mass Range	200 Da to 10 MDa (proteins) or 1 MDa (linear polymers)*
Molecular Size Range (R_g)	10 nm to 50 nm, up to 150 nm with shape-specific models
Molecular Size Range (R_h)	In flow mode, 0.5 nm to 30 nm; batch mode 0.5 nm to 1 µm (requires WyattQELS DLS module or DynaPro® NanoStar® + fiber optic connection)
Sensitivity	3.5 ng of 100 kDa polystyrene in THF or 70 ng of BSA in PBS, assuming a 15 cm UHPLC-SEC column
Optics	
Detectors	
MALS Detectors	High-gain, high dynamic range photodiodes at 3 detection angles
Dynamic Range	3,300,000:1
Auxiliary Detectors	Laser monitor for stabilization feedback; forward transmission monitor to correct signals for absorbing samples and to assess data quality
DLS Detector (optional)	WyattQELS dynamic light scattering module installs directly inside the microDAWN chassis. Alternatively, the optical fiber pickup of the DynaPro NanoStar cuvette-based DLS instrument may be installed in the DAWN.
Laser Properties	
Laser Wavelength	658 nm ± 4 nm
Laser Power Control	Programmable 10% to 100%
Sample Temperature Control	Ambient
Interdetector Band Broadening	(Increase in FWHM @ 0.3 mL/min) Upstream detector to microDAWN: < 1.5 µL; Upstream detector to downstream detector: < 1.6 µL
Wetted Materials	316 stainless steel, fused silica, PEEK, PTFE, MP35N iron-free alloy
Electronics	
Analog Inputs	2 differential analog inputs with 24 bit resolution; Input range -10 V to +10 V
Analog Outputs	1 analog output from user selectable measurements channels -10 V to +10 V
Other Inputs/Outputs	Alarm in, Alarm out/retransmit, Auto-inject in, Auto inject contact closure retransmit, Recycle In/Out (operates Orbit™ recycle valve)
Computer Interface	Ethernet
Front Panel Display	162.5 mm, 16-bit, high resolution touch screen displays signal graphs, instrument settings and diagnostics
Data Rate	Up to 73 Hz
Dimensions	58 cm (L) x 36 cm (W) x 18 cm (H)

* Depending on *dn/dc*, the sample concentration and chromatography conditions, this is typical.
The upper size limit is set by the rms radius of the molecule, with a maximum size for reliable M_W of 50 nm.

Wyatt Technology is committed to continual improvement. Specifications subject to change without notice.

Warranty: All Wyatt instruments are guaranteed against manufacturing defects for 1 year.

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Left to Right
Geofrey K. Wyatt, Chief Executive Officer
Dr. Philip J. Wyatt, Chairman of the Board
Clifford D. Wyatt, President

For more than 35 years, we've operated as one of the very few remaining family-owned businesses in the analytical instrument industry. With installations in more than 65 countries, over 15,000 refereed journal publications citing our instruments and more than 25 PhD scientists on staff, we take great pride in the worldwide recognition that Wyatt Technology has received as a leading manufacturer of instruments and software for absolute macromolecular and nanoparticle characterization. Our dedication to providing customers with comprehensive training and personal support has made us the gold standard in this field.

The microDAWN is one of many tools in Wyatt's Light Scattering Toolkit for Essential Macromolecular and Nanoparticle Characterization.

Learn more at www.wyatt.com

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