Agilent 385-ELSD
Evaporative Light Scattering Detector

For Low Molecular Weight Compounds

Data Sheet

Introduction

Evaporative light scattering detectors are ideal for detecting analytes with no UV chromophore as they do not rely on the optical properties of a compound. The Agilent 385-ELSD Evaporative Light Scattering Detector is the latest high performance ELSD from Agilent, benefitting from almost 20 years experience in the design and manufacture of evaporative light scattering detectors. The Agilent 385-ELSD is the only ELSD that delivers sub-ambient operation, for unrivalled detection of thermally labile analytes. Designed for the analysis of all compounds, the Agilent 385-ELSD delivers evaporation down to 10 °C, providing maximum sensitivity for compounds with significant volatility below 30 °C. Programmable control of gas flow and temperature during an injection eliminates solvent gradient effects and maximizes response for improved accuracy. To detect everything you inject with high sensitivity, the Agilent 385-ELSD is the ELSD of choice for all applications.

Key Benefits

- High sensitivity provides superb responses for all compounds, down to low nanogram levels.
- Sub-ambient operation using a Peltier cooled evaporation tube delivers temperatures down to 10 °C, preventing degradation of the thermally labile compounds that other ELSDs cannot detect.
- Real-time control during an injection using programmable Dimension Software maintains maximum sensitivity throughout the run.
- Real-time gas programming using Dimension Software eliminates solvent enhancement effects during gradient elution, for excellent quantification.
- Low dispersion and high-speed data output rates are the perfect match for Fast LC applications.
- Superb reproducibility below 2% gives reliable and accurate results.

Agilent Technologies

Key Benefits (Continued)

- Multi-vendor software control and data acquisition using Agilent ChemStation chromatography data system, and other vendors' interfaces, eliminates the need for an analog to digital converter.
- Rapid heating and cooling of the evaporator tube minimizes equilibration time
- Full DMSO transparency ensures that responses from early eluting compounds are not hidden.
- Fully integrated with all Agilent analytical and preparative LC systems for the complete chromatographic solution.
- Complementary to LC/MS.

System Details

The Agilent 385-ELSD delivers sub-ambient evaporation down to 10 °C, providing maximum sensitivity for compounds with significant volatility below ambient temperature. The instrument benefits from fast data output rates and extremely low dispersion for fast LC, and delivers a universal response down to the low-nanogram range for truly representative analysis. Reproducibility is less than 2% for improved consistency of results. The Agilent 385-ELSD offers real time gas management that eliminates solvent effects to give a constant response across a gradient. Control and digital data collection come as standard for multi-vendor platforms so there is no need for an analog to digital converter. On-the-fly adjustment of light source intensity can save time during a run. All this in the smallest footprint available. Being complementary to LC/MS, and offering unrivalled flexibility and sensitivity, the Agilent 385-ELSD is the ELSD of choice for the most demanding applications.

Agilent's Family of Evaporative Light Scattering Detectors

Evaporative light scattering detection is the powerful alternative to RI and UV–inject it and detect it, right down to low nanogram levels. ELSDs provide a universal response independent of the optical properties of the analyte so there is no loss of important information.

You can use Agilent's ELSDs for a very wide range of analytical techniques, including LC (analytical and preparative), LC/MS, SFC, high throughput screening, GPC/SEC, TREF, and GPEC. The range of application areas is equally broad, encompassing pharmaceuticals, nutraceuticals, combinatorial libraries, carbohydrates, lipids, phopspholipids, triglycerides, fatty acids, amino acids, polymers, and surfactants.

As the Agilent 385-ELSD delivers sub-ambient evaporation down to 10 °C, it provides maximum sensitivity for compounds with significant volatility below 30 °C. For non-volatile compounds, where temperatures of 100 °C or above are required, the Agilent 380-ELSD is the instrument of choice.

Choose the Right Agilent ELSD for Your Needs

	Agilent 385-ELSD	Agilent 380-ELSD
HPLC analysis:		
Non-volatile compounds:	yes	yes
Semi-volatile compounds:	yes	yes
Highly volatile compounds:	yes	x
Ambient GPC analysis:	yes	yes
High temperature GPC analysis:	x	x

Installation Qualification and Operation Qualification (IQOQ)

All Agilent's ELSD s are rigorously tested to a high specification before they are shipped, and detailed IQOQ documentation is included with every unit. In addition, our detectors can be incorporated into any LC system, and a complete Qualification Workbook is provided to help you.

Uniform Mass Response

Agilent ELSDs are not dependent on a compound's optical properties so the ELSD provides a more uniform response than UV-VIS, making it the ideal detector for purity analysis or where calibration standards are not available.

Column:	Polaris C18 4.6 × 150 mm, 5 µm
Eluent:	Water/Acetonitrile 1:1
Flow rate:	1.0 mL/min
Injection volume:	10 µL
Detector:	Agilent 385-ELSD (neb = 30 °C, evap = 30 °C, gas = 1.4 SLM)

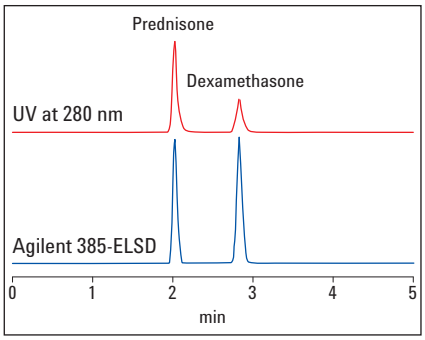


Figure 1
The Agilent ELSD delivers a more uniform mass response than UV from a 1:1 mixture.

Agilent ELSDs - Better by Design

Evaporative light scattering detection involves a three-stage process.

1. **Nebulization**–Using an inert gas stream to form a plume of uniformly sized droplets.
2. **Evaporation of the eluent**–Generating a plume of non-volatile solute particles.
3. **Optical detection**–Where the intensity of scattered light is proportional to the mass of solute passing through the optical chamber.

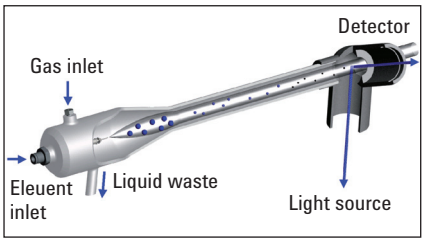
Nebulization

Efficient nebulization using low gas flow rates is a feature of Agilent ELSD's. Independent nebulizer temperature control and digital gas flow control provide excellent stability and reproducibility. Baseline noise is minimized by the removal of any poorly nebulized eluent through a a drain port.

Evaporation

The nebulized stream passes through an independently temperature-controlled evaporator tube where solvent is removed at high temperature, leaving the less volatile solute particles behind.

The Agilent 385-ELSD features patented[1] gas flow control technology with a short evaporator tube that gives an extremely low swept volume for minimal peak dispersion. This provides maximum resolution from the separation, especially important for work with small columns.



Optical detection

The solute particles are detected as they pass through the optical chamber. The high power LED and advanced design of the electronics delivers maximum sensitivity.

[1] UK Patent 0304253.8, US Patent 6/0238744

Fast LC

The excellent baseline stability across steep gradients and low dispersion characteristics combined with fast data output rates makes the Agilent 385-ELSD ideal for fast LC.

Sample:	Tertiary aminols
Column:	C18 4 × 50 mm, 5 µm
Eluent A:	Water + 0.1% Formic acid
Eluent B:	Acetonitrile + 0.1% Formic acid
Gradient:	5% to 95% B in 5 min
Flow rate:	2.5 mL/min
Injection volume:	10 µL
Detector:	Agilent 385-ELSD (neb = 40 °C, evap = 50 °C, gas = 1.5 SLM)

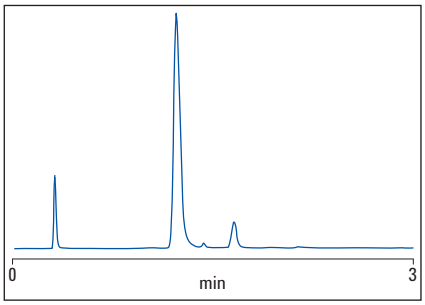


Figure 2
The Agilent 385-ELSD provides a stable baseline even across steep, high speed gradients.

Unrivalled Uniform Response across a Gradient

The Agilent 385-ELSD is unique in its ability to control gas flows during a run to produce a uniform detector response across a gradient. This real-time benefit offers an alternative approach to mobile phase compensation when quantifying unknowns under gradient conditions.

Column:	Pursuit C18 2.1 × 150 mm, 5 µm
Eluent A:	Water
Eluent B:	Acetonitrile
Gradient:	5% to 95% B in 10 min
Flow rate:	1.0 mL/min
Injection volume:	10 µL (every min)
Detector:	Agilent 385-ELSD (neb = 30 °C, evap = 30 °C)

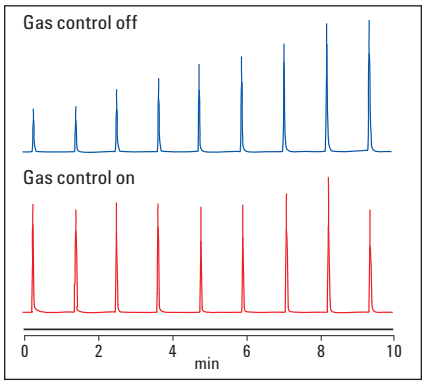


Figure 3
Real-time gas control using Dimension Software provides unrivalled uniformity across a gradient.

Sub-ambient ELSD

The Agilent 385-ELSD's unique cooled evaporation zone provides sub-ambient operation to deliver unrivalled detection of low molecular weight compounds not seen by other evaporative light scattering detectors.

Sample:	Parabens
Column:	Pursuit C18 2.1 × 150 mm, 5 µm
Eluent A:	Water
Eluent B:	Acetonitrile
Gradient:	5% to 70% B in 5 min; 70% to 95% B in 2 min
Flow rate:	0.2 mL/min
Injection volume:	10 µL
Detector:	Agilent 385-ELSD (neb = 30 °C, evap as shown, gas = 1.4 SLM)

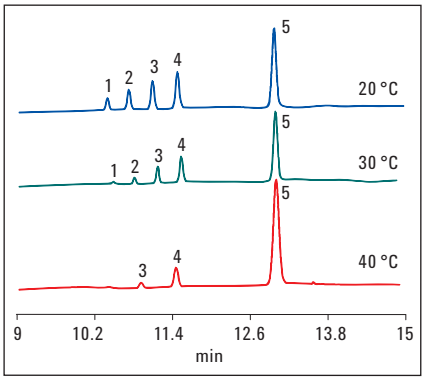


Figure 4
Improved detection of parabens using sub-ambient ELSD with the Agilent 385-ELSD (parabens mixture injected at 100 ng except heptyl at 160 ng).

Superb RSD

Excellent reproducibility below 2% gives reliable and accurate results. You can have complete confidence in your data.

Column:	Pursuit C18 150 x 4.6 mm, 5 µm
Eluent:	Water/Acetonitrile 40:60
Flow rate:	1.0 mL/min
Injection volume:	10 µL
Detector:	Agilent 385-ELSD (neb = 40 °C, evap = 40 °C, gas = 1.4 SLM)

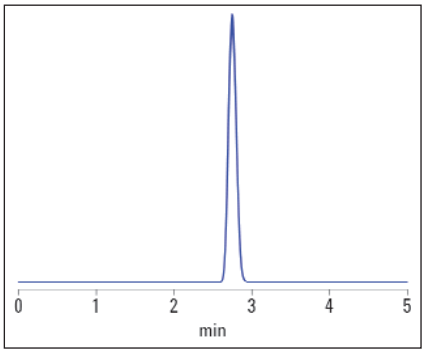


Figure 5
Fifty caffeine injections produce an RSD of 1.27%, demonstrating the superb reproducibility of the Agilent 385-ELSD.

Fast Temperature Switching

For higher throughput of samples, the unique Agilent 385-ELSD features rapid temperature equilibration. The detector cools from 50 °C to 30 °C, and vice versa, in just over five minutes. In addition to the enhanced detection of semi-volatile compounds, the temperature controlled evaporator tube on the Agilent 385-ELSD allows the user to rapidly change between temperature programs.

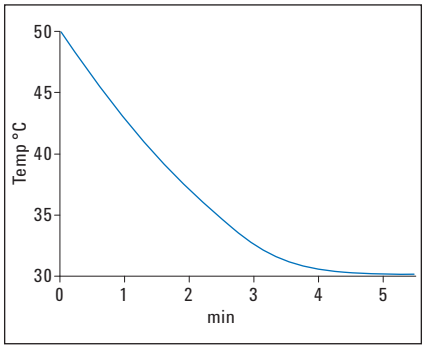


Figure 6
Fast temperature equilibration with the Agilent 385-ELSD.

DMSO Transparency for High Throughput Screening

The vast majority of combinatorial libraries screened by high throughput methods are stored in dimethylsulfoxide (DMSO). UV and mass spectrometry will miss potential drug compounds that have no UV chromophore so ELSD is commonly used. However, at the low evaporator temperatures required to detect volatile components, the presence of DMSO in the sample can mask the response of early eluting compounds. In the Agilent 385-ELSD, the addition of a carefully controlled stream of gas to the evaporation step enables complete removal of the DMSO to take place without increasing the operating temperature.

Sample:	2 mg/mL in DMSO
Column:	4.6 × 150 mm, 5 µm
Eluent A:	0.1% HFBA in Water
Eluent B:	0.1% HFBA in Acetonitrile
Gradient:	5% to 30% B in 10 min, 30% to 80 % B in 5 min
Flow rate:	1.0 mL/min
Injection volume:	20 µL
Detector:	Agilent 385-ELSD (neb = 25 °C, evap = 25 °C, gas as shown)

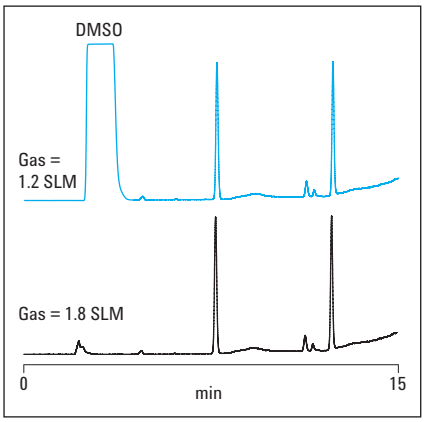


Figure 7
Increasing gas flow on the Agilent 385-ELSD gives DMSO transparency.

Adding Value to LC/MS

The Agilent 385-ELSD is fully complementary to LC/MS. The instrument can provide better data and support information for compounds that do not perform well on mass spectrometers, such as haloperidol, enhancing the value of your LC/MS system.

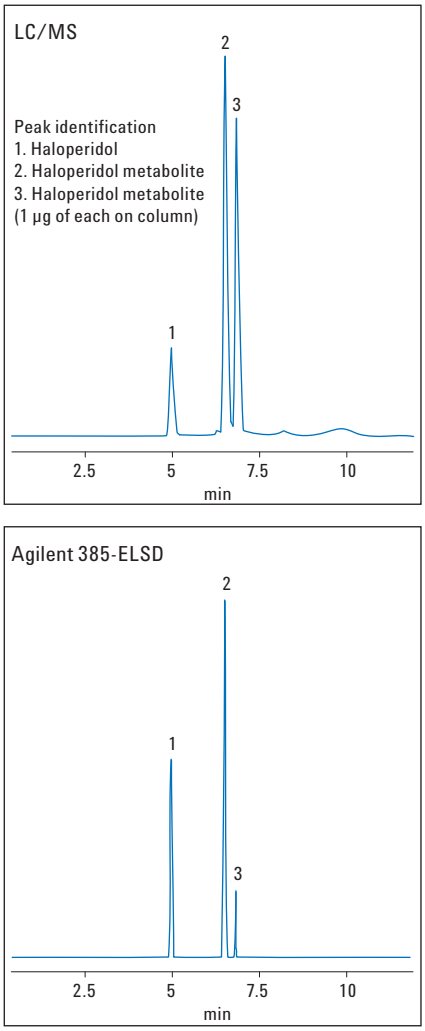


Figure 8
Coupling the Agilent 385-ELSD with LC/MS reveals much greater detail in the analysis of haloperidol and its metabolites.

Use of the sophisticated Agilent 385-ELSD software ensures improved detection of compounds not normally amenable to LC/MS.

Choosing Detector Settings

The unique patented gas flow operation of the Agilent ELSD makes it mobile phase independent. Instead, settings are optimized according to the thermal sensitivity of compounds injected.

As a general rule, all solvents can be evaporated with nebulizer and evaporator temperatures at 30 °C and a gas flow of 1.6 SLM. This can be used as a starting point and adjustments made according to the sample injected (if necessary), see Table 1.

Compound class	Nebulizer temp. (°C)	Evaporator temp. (°C)	Gas flow (SLM)
Parabens	30	20	1.40
Vitamins	25	25	1.60
Phthalates	25	25	1.60
Analgesics	25	25	1.60
Sudan dyes	30	30	1.60
Glycerides	30	30	1.40
Alkaloids	40	40	1.40
Amino acids	50	50	1.60
Natural products	30	50	1.40
Antibiotics	40	85	1.20
Polar lipids	30	80	0.90
Carbohydrates	50	90	1.00

Table 1
Choosing detector settings.

Technical Specifications

Agilent 385-ELSD		
Light source	LED 480 nm (Class 1 LED Product)	
Detector	Photomultiplier tube digital signal processing	
Temperature range	Evaporator	OFF, 10–120 °C (1 °C increments)
	Nebulizer	OFF, 25–90 °C (1 °C increments)
Gas requirements	Flow rate	0.9 SLM to 3.25 SLM at 25 °C with integrated controlled gas shut-off valve
	Pressure operating range	60–100 psi (4–6.7 bar)
Eluent flow rate	0.2–5 mL/min	
Analogue output	0–1 V FSD	
Digital output	24 bit digital data, 10, 40, or 80 Hz	
Communication	Serial (RS232) Remote start Input Remote A/Z Contact closure TTL	
Instrument operation	Graphical vacuum fluorescent display with keypad Real-time control through ELSD Dimension Software 10 predefined methods	
PC operation (software)	Standalone control software utilities, Agilent ChemStation control software, Agilent EZChrom Elite control software (available September 2011)	
Power requirements	90/120V AC or 220/250V AC 50/60 Hz 2A max	
Detector status	Standby, run	
Size	Unpackaged	200 × 450 × 415 mm (w × d × h)
Weight	Unpackaged	13 kg
Safety features	Gas shut off valve, vapor and leak detection	

Ordering Information

Product description	Part number
Agilent 385-ELSD (110 or 240 V) including ChemStation driver	G4261A
Agilent ELSD Dimension Software	PL0890-0375
Agilent ELSD Driver for ChemStation	PL0890-0370

www.agilent.com/chem/elsd

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