BrightSpec

Introducing the

isoMRR

Providing simple, precise chemical analysis for leading pharmaceutical, chemical and consumer goods companies around the world.

Spring 2025

Meet the isoMRR

Analytical Chemistry Simplified.

The isoMRR offers a comprehensive solution for quantifying volatile residuals and flavors and fragrances, with the added capability of chiral analysis for compounds in BrightSpec's library.

Combining precision with versatility, this instrument addresses a wide range of analytical needs in one platform, including accurate and reliable quantification for complex molecular species like isomers and enantiomers.

Designed for routine analysis in both research and industrial applications, the isoMRR enhances efficiency by streamlining workflows, reducing the need for multiple instruments, and accelerating time to results, making it an indispensable tool for industries such as pharmaceuticals, consumer goods, food and beverage, and
chemical manufacturing.

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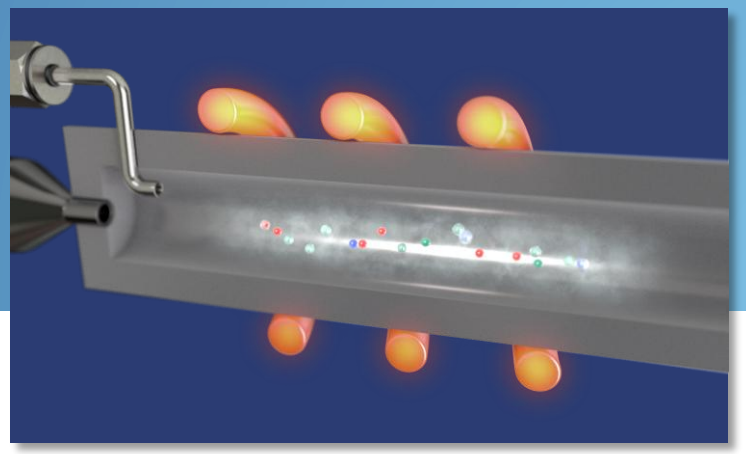
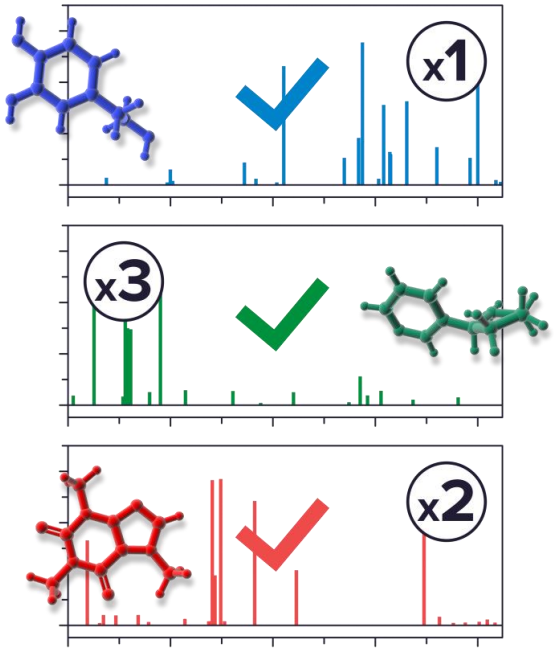
Technology

About BrightSpec MRR

The BrightSpec-MRR product line encompasses analytical instruments used to study the rotational spectra of small molecules in the gas-phase.

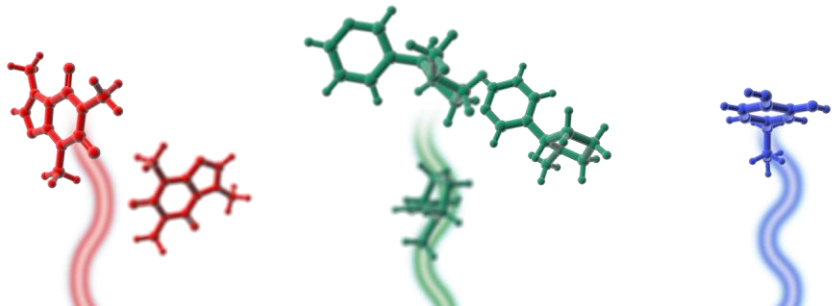




Theoretical Spectra

Our instruments utilize MRR technology and microwave-wave radiation to **excite molecular rotational transitions,** which can then be measured and analyzed to determine the molecular structure and quantify the analyte of interest.

BrightSpec is the pioneer and global leader in MRR technology, offering the only commercially available MRR instruments on the market. These groundbreaking instruments are transforming analytical chemistry, enabling unparalleled precision and efficiency in applications such as reaction optimization, structure validation, and targeted quantitation.

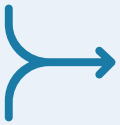


The isoMRR Advantage

Forget complex methods and incomplete results. Precision made simple.

Unambiguous Structure
MRR spectra are highly specific to the three-dimensional structure of molecules in the gas phase, allowing you to quantify structures with confidence, even when molecules exhibit isomerism or chirality.

Simplified Methods
The Edgar software suite provides users with simple application driven methods for accurate and reproducible quantitation in complex mixtures.



Streamlined Workflow
The isoMRR provides structurally specific quantitation in a single measurement, eliminating the need for sample prep, columns and multiple techniques.

Time Savings
BrightSpec's solution delivers results with unprecedented speed and precision, accelerating development without sacrificing accuracy.

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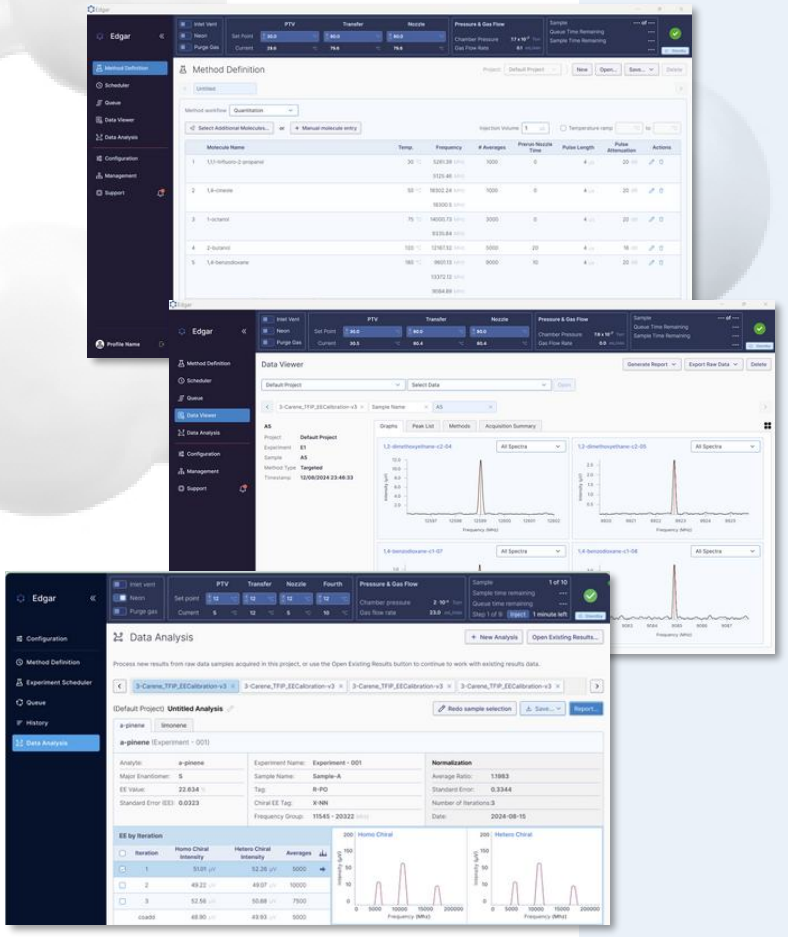
User-Friendly Software

From Spectra to Solutions in Seconds

Spectroscopy Simplified

Accelerate your workflow with a software suite designed to make rotational spectroscopy fast, simple, and scalable. Identify, quantify, and monitor chemical compounds with unprecedented clarity and speed.



Streamlined Workflows

Our end-to-end software suite guides complex molecular analysis, enabling chemists to achieve precision without specialized training or complex hardware dependencies.

Superb Results

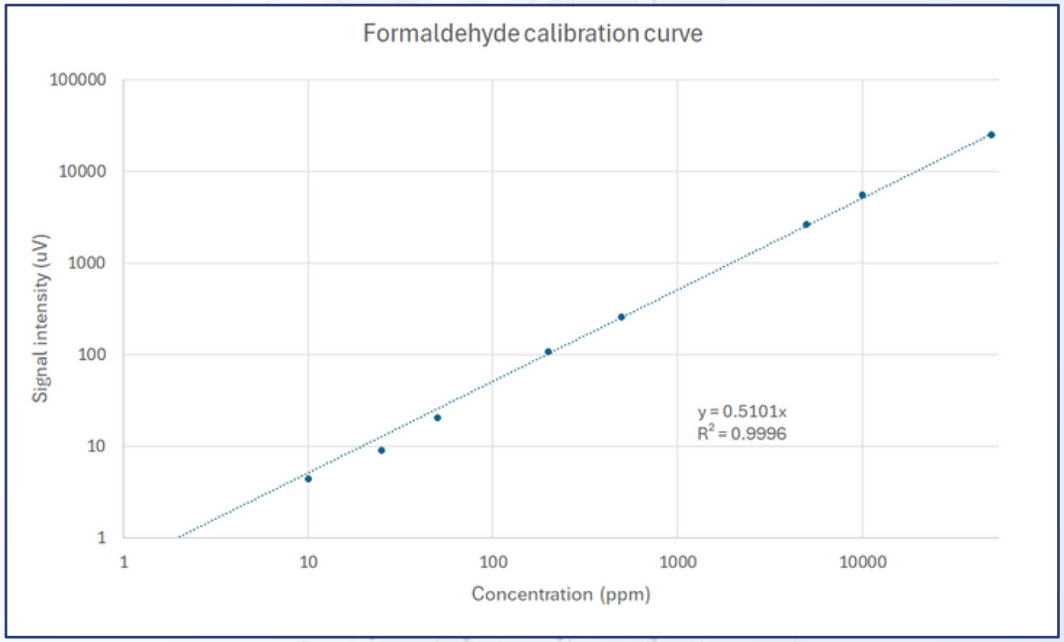
Empowering industrial chemists with intuitive rotational spectroscopy tools that deliver faster, more accurate molecular analysis. Our software suite transforms complex spectroscopic data into actionable insights, reducing analysis time from hours to minutes.

Chemical Applications

Quantifying Formaldehyde

Formaldehyde lacks strong chromophores or fluorophores, complicating direct detection. These characteristics demand specialized methodologies, such as derivatization or modified stationary phases, to ensure accurate quantification.

The isoMRR platform offers a powerful and flexible solution for formaldehyde detection, delivering a linear response over 3 orders of magnitude. Unlike conventional methods that require time-consuming and error-prone sample preparation, the isoMRR achieves these results with direct sample injection, streamlining workflows and minimizing operational complexity.



Why Use isoMRR?

- Direct measurement of formaldehyde with no derivatization.
- No columns or chromatography
- No sample prep or hazardous materials

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Ensuring Essential Oil Authenticity with MRR Spectroscopy

Essential oil purity and authenticity are critical for product quality and consumer trust. Traditional methods like GC-MS struggle with isobaric compounds, co-elution, and extensive method development. BrightSpec's **isoMRR™ platform** overcomes these limitations, offering a **fast, highly specific, and reproducible** solution for essential oil analysis.

Results	MRR Concentration Converted to GC Peak Area (%)			Concentration Range (%)
	SAMPLE 1	SAMPLE 2	SAMPLE 3	US STANDARD
Limonene	3.18	3.70	1.72	1–2.5
Eucalyptol	6.82	7.61	4.78	4–6
Trans Sabinene Hydrate	0.36	0.04	0.91	0.5–2.3
Menthone	25.45	18.67	22.09	15–25
Isomenthone	4.21	4.77	3.28	2–4.5
Menthofuran	0.66	0.39	2.21	1.5–6
Neomenthol	3.02	3.78	3.85	2.5–4.5
Menthyl Acetate	3.83	4.46	4.52	3–6.5
Menthol	43.68	47.57	40.57	36–46

Key Advantages of MRR for Essential Oil Testing:

Direct Identification & Quantification
No need for separation; detects and measures key components in a single run.

High Sensitivity
Accurately identifies minor and major terpenes, crucial for detecting adulteration.

Faster & More Efficient
Cuts analysis time by **80%** compared to conventional methods.

MRR analysis of three peppermint oil samples revealed clear differences in composition, with variations in key terpenes that indicate potential adulteration. This rapid, precise approach ensures essential oils meet expected quality standards and helps detect inconsistencies.

A New Standard in Essential Oil Analysis

BrightSpec's **isoMRR platform** eliminates complex workflows, reduces costs, and provides **unparalleled precision** in essential oil testing.

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Pharmaceutical Applications

Residual Solvent Analysis

The pharmaceutical industry has struggled to quickly and efficiently confirm and quantify problematic residual solvents without time-consuming method optimization—until now. Enter BrightSpec's isoMRR™ platform, the first commercially available molecular rotational resonance (MRR) spectroscopy instrument. Powered by headspace MRR, this technique is packaged in automated instrument form, offering a straightforward, breakthrough approach that gets you identity and quantitation data in a single measurement.

This innovative technology addresses longstanding challenges in the industry, providing a rapid, accurate, and highly selective method for identifying and quantifying residual solvents without the extensive method development required by traditional gas chromatography. The data demonstrates the isoMRR's exceptional performance in terms of method selectivity, repeatability, as well as its robustness across various drug substances.

Recovery Rate of Various Residual Solvents across Three Drug Substances

Residual Solvent	Acetaminophen (%)	Aspirin (%)	Ibuprofen (%)
Methanol	97.3	91.5	92.3
Acetonitrile	101.9	107.5	104.8
Nitromethane	86.1	82.4	79.4
2-Methoxyethanol	106.7	106.9	106.4
2-Ethoxyethanol	117.6	95	103.5

Why Use isoMRR?

- Robust performance in complex matrices
- Continuous headspace sampling for better sensitivity
- Orthogonal validation of predicate techniques

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Specifications

Instrument Specs

Frequency Range	6-18 GHz
Liquid Temperature Range	RT-300C
Headspace Temperature Range	RT-200C
Shipping Weight	1000 lbs
Footprint	67” L x 37” W x 72” H
Power Supply	120V 15A
Carrier Gas	Neon
Certifications	CE

Analytical Specs

Sample Type	Liquid, Solid, Headspace
Materials Required (Liquid)	50 µL (Typical)
Materials Required (Headspace)	100 µL (Typical)
Mass Range	50-300 AMU
Sensitivity (LOQ)	<10 ppm
Time to Result	2-20 Min.
Repeatability	<10% RSD
Linearity	R2 >0.99
Reference Library	>500 Compounds
Chiral Analysis	Yes
Structure Analysis	No

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