

## • verTera VERTEX 80v cw Terahertz Extension

The VERTEX 80v is the gold standard for FTIR spectroscopy in research and development. The unique verTera extension even upgrades the VERTEX 80v to the first and only combined FTIR/continuous wave THz spectrometer with exciting possibilities.

- Integrated state of the art cw THz technology
- Spectral range down to  $3 \text{ cm}^{-1}$  ( $< 90 \text{ GHz}$ )
- No cryogenically cooled components
- Unique effective spectral resolution  $< 0.0007 \text{ cm}^{-1}$  ( $< 20 \text{ MHz}$ )
- Same sample compartment & accessories for FTIR and THz
- Highest THz performance by vacuum & unique THz algorithm
- FTIR and THz controlled via powerful OPUS software

The VERTEX 80v is a powerful FTIR spectrometer also capable to access the THz range (approx. below  $50 \text{ cm}^{-1}$ ), but the single digit wavenumber range or e.g. highest spectral resolution do typically require bolometers at liquid He temperature. THz technology is complementary: it cannot access the important classical infrared range but allows for THz spectroscopy with room temperature components. verTera combines the benefits of both technologies, providing a unique and complete analysis of your samples.

### State of the Art CW THz Technology

verTera makes use of high precision semiconductor based photomixers, converting near infrared laser light into THz radiation. Source and detector are integrated into the VERTEX 80v beam path and the class 1 NIR laser radiation is connected via fiber and vacuum tight feedthrough.

### Highest THz Performance by Vacuum

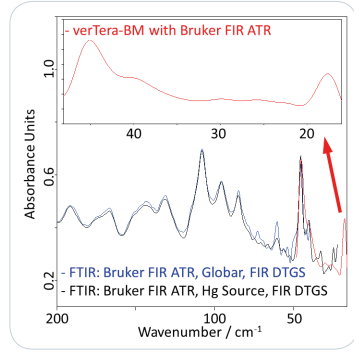
Vacuum operation strongly reduces unwanted atmospheric interferences and provides utmost stable conditions, resulting in significantly higher THz performance.

### Highest Resolution by Unique THz Data Processing

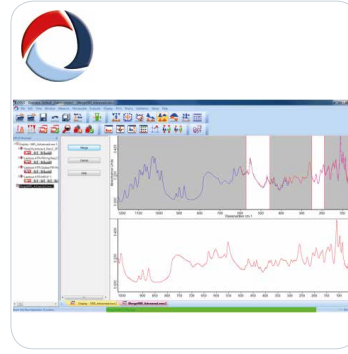
The standard approach to extract just the extrema of the oscillating photocurrent signal strongly degrades spectral resolution. Only verTera uses a unique algorithm achieving a significantly better effective spectral resolution  $< 0.0007 \text{ cm}^{-1}$  ( $< 20 \text{ MHz}$ ) similar to the applied THz step size.



Convenient FTIR and cw THz measurements in the same vacuum sample compartment under identical conditions.



ATR measurement of Lactose showing the THz advantage of verTera versus FTIR with FIR room temperature detector.



FTIR and THz data can be measured and processed by the powerful OPUS software with various functions.

### One Spectrometer for infrared, THz and more

Including verTera extension the VERTEX 80v can in its broadest configuration cover an impressive spectral range from 3 cm<sup>-1</sup> to 50,000 cm<sup>-1</sup> from THz to UV. verTera is applicable with several THz compatible FTIR sample compartment accessories such as transmittance, gas cells, reflectance and THz compatible ATR units, allowing for a unified workflow in a broad spectral range.

### Unmatched VERTEX 80v Flexibility

The THz detector can be exchanged with a FTIR detector such that full flexibility for multi spectral FTIR measurements remains. Also other well-known options such as bolometer or right hand side Hyperion microscope adaption, rear and right hand side emission port (e.g. for adaption of Raman or PL module) and automatic beam splitter exchange unit remain available.

### Benefit of powerful OPUS Spectroscopy Software

OPUS is a versatile and intuitive software aligned with the requirements of professional research, development and routine applications. Besides measurement and the possibility to merge FTIR and cw THz spectra, OPUS offers various functions for data evaluation and processing, such as integration, quantification, identification, macro engine and many more.

Covered by one or more of the following patents: DE102004025448; DE19940981. Additional patents pending.

### THz spectroscopy down to the limits without cryogenics

Bolometers are well-proven high sensitivity THz detectors down to 5 cm<sup>-1</sup> but the required liquid Helium adds costs, demands expertise and is in some regions not available at all. Alternative dry e.g. pulse tube cooled bolometers are rather costly, may cause harmful vibrations and require several hours cool down time. The verTera extension is ready at the push of a button, creates no nameable operation costs and can achieve a superior lower spectral limit and resolution.

### Expand your view by the combination of FTIR and cw THz

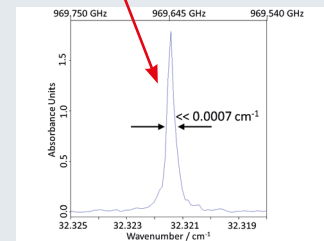
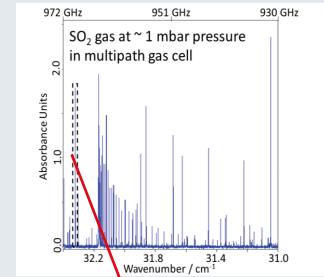
The VERTEX 80v is a powerful tool in various fields of research and development. The increased spectral range and improved THz resolution provided by verTera add valuable information for many applications, e.g.: polymorphism, polymer research, high resolution gas spectroscopy, crystal structure (solid state & semiconductor physics) and pharma or drug related research.

### Available verTera Versions

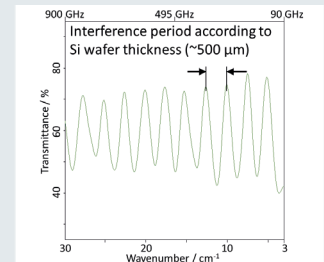
Depending on requirements, the verTera extension is available for 3 different spectral ranges:

Version	Spectral Range	Spectral Resolution
verTera-B	3 to 40 cm <sup>-1</sup> (90 GHz to 1.2 THz)	< 0.0007 cm <sup>-1</sup> (< 20 MHz)
verTera-BM	13 to 50 cm <sup>-1</sup> (0.4 to 1.5 THz)	< 0.0007 cm <sup>-1</sup> (< 20 MHz)
verTera-BS	27 to 60 cm <sup>-1</sup> (0.8 to 1.8 THz)	< 0.0007 cm <sup>-1</sup> (< 20 MHz)

### Spectroscopic Performance



For gas spectroscopy at low pressure verTera can reveal pure rotational transitions with a unique achievable spectral resolution < 0.0007 cm<sup>-1</sup> (< 20 MHz).



THz Transmittance of an ultra-pure Silicon wafer, proving the spectral range of verTera-B down to 3 cm<sup>-1</sup>. The observed interference fringes are due to multiple internal reflections inside the wafer and in good accordance with the sample thickness.

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