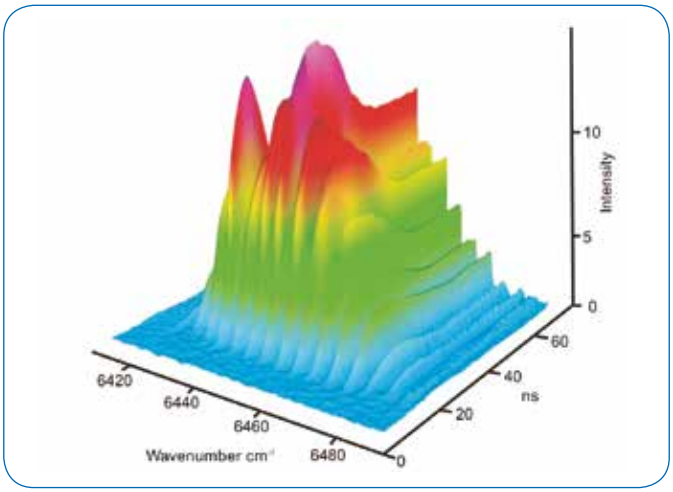
Product Note T16-01/10

# S510/x Step-Scan TRS experiments




## Time Resolved Spectroscopy (TRS) Step-Scan

Modern Step-Scan spectroscopy was commercially introduced by Bruker Optics in 1985 and honored by the R&D 100 award in 1988. Today, Bruker Optics offers a comprehensive range of step-scan based instrumentation for the most demanding investigations with capabilities that achieve the highest signal-to-noise and greatest temporal resolution for repetitive time-resolved spectroscopy (TRS) kinetics experiments. Many publications have been generated by Bruker Optics customers using step-scan TRS to include investigations of organometallic complexation reactions, the characterization of ferroelectric liquid crystals, crystalline laser, and semiconductor materials, as well as a variety of photobiological systems. In addition, Bruker Optics has been a leader in innovating lock-in phase and amplitude modulation instrumentation and methodology. Bruker Optics introduced the first commercial DSP controlled and mathematical demodulation phase modulation instrumentation. For more information on step-scan TRS including measurement examples, see the booklet "Introduction to Step Scan FTIR".

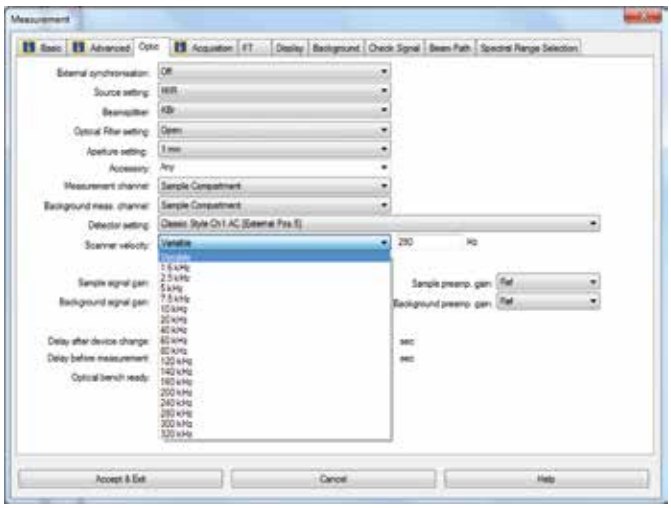
Requirement for operation:
Step-Scan option S510/x, fast detector e.g. Dxxx/B or D317/BF with transient recorder and OPUS/3D software package.

| Step-Scan TRS | |
|---|---|
| **Functionality** | **Specifications** |
| Phase Corrections | Calculated, Stored or Signed, AC/DC separate |
| In-Step Co-Addition | Yes |
| In-Step Time Averaging (Oversampling) | Yes |
| Internal DigiTect ADC Speed, 24 bit Dynamic Range, dual channel | 6 µsec |
| Transient Recorder Digitizers Speed, 14 bit Dynamic Range, PCI-Interface, 2 channels | 2.5/4 nsec or 100 nsec |
| Second Channel for Pulse Weighting and/or DC Coupling | Yes |
| FT-IR as Trigger Master or Slave (both + and - TTL edges) and External Master Time Base Capability | Yes |
| Negative Trigger Delay for Reference Spectra | Yes |
| Data Acquisition Pulse TTL Generator | Yes |
| Easy Manipulation of 3-D Data | Yes |
| Display Interferogram During Data Acquisition | Yes |

| Preamplifier and ADC specifications for MCT detectors using INVENIO or VERTEX series spectrometers | | |
|---|---|---|
| | **With Internal Standard ADC and MCT Photo Voltaic/MCT Photo Conductive** | **With PCI-Transient Recorder and Fast MCT Photo Voltaic (D317/BF)** |
| **Preamp AC cut-off Frequency:**<br>**Preamp AC cut-on Frequency:** | ca. 220 KHz<br>16Hz (62 msec) | ca. 20 MHz<br>160 Hz (6.2 msec) |
| **ADC max. Sampling Rate:**<br>**AD Conversion Time:** | ca. 166 KHz, dual channel<br>6 µsec | 400/250 MHz and 10 MHz<br>2.5/4 nsec or 100 nsec |
| **AC/DC Slew-Rate Limit:**<br>**Rise Time (3 AD-Conversions)** | 2.8 V/µsec<br>18 µsec | 2.3 V/nsec<br>7.5/12 nsec or 300 nsec |
| **DC Option:** | Electrically available. Freely switchable and configured via OPUS | Analog Output Cable (as for AC) |

## Slow Scan

The Step-Scan option S510/x for the INVENIO and VERTEX spectrometer series includes slow scan functionality. Beside the standard velocities of the moving interferometer mirror a large variety of continuously variable scanner velocities are selectable in the OPUS measurement menue „Optics“ (see screenshot beside). In particular interferometer scanning velocities slower than VEL=1.6kHz are available. The slowest scanning velocity of 10Hz which relates to the HeNe control laser modulation frequency at ca. 15.800 $cm^{-1}$ (632 nm) and corresponds to 0.00063 cm/sec optical path difference speed, is possible with VERTEX 80 and 80v.



A very typical measurement application is the so-called Photo Thermal Ionization Spectroscopy (PTIS) or as well named Fourier Transform Photocurrent Spectroscopy (FTPS) in which the sample itself (typically a semiconductor) is used as detector [1].

Reference:

[1] A. Hikavyy et al., Phys. Stat. Sol. (a) 203, No. 12, 3021–3027 (2006)