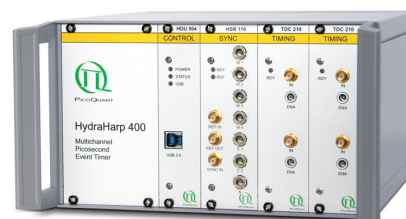


HydraHarp 400

Multichannel Picosecond Event Timer and TCSPC Module with USB Interface



- Compact box with modular, scalable design (patented)
- Up to eight identical synchronized but independent input channels
- Common sync for all input channels
- Count rate up to 12.5 million counts/sec per channel
- 65536 histogram bins per channel, minimum width 1 ps, 32 bits deep
- Multi-stop capability for efficiency at slow repetition rates
- Histogrammer measurement range from 65 ns to 2.19 s
- Time-Tagged Time-Resolved (TTTR) mode
- External marker signals for imaging or other experiment control
- USB 3.0 interface

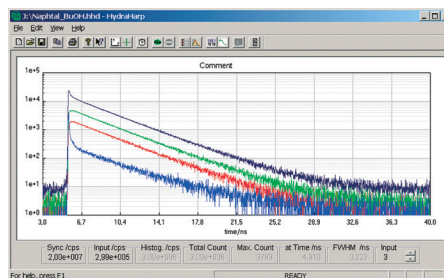


Applications

- Diffuse Optical Tomography (DOT) and molecular imaging
- Coincidence correlation
- Time-resolved fluorescence and luminescence spectroscopy
- Fluorescence Lifetime Imaging (FLIM)
- Single molecule spectroscopy
- Quantum optics
- Time-of-Flight (TOF) measurements, LIDAR and ranging

The HydraHarp 400 is a high-end, easy to use, plug and play Time Interval Analyzer (TIA) and Time-Correlated Single Photon Counting (TCSPC) system with scalability for multiple channels. Dependent on the chosen frame size, up to 4 or up to 8 channels can be installed. It is connected to a PC through a USB 3.0 interface (covered by patent DE 10 2008 004 549). It provides identical synchronized but independent input channels. They can be used as detector inputs for coincidence correlation experiments or as independent stop inputs for TCSPC. A dedicated common sync input is provided for TCSPC with fast excitation sources. This allows forward start-stop operation at the full repetition rate of mode locked lasers with stable repetition rate up to 150 MHz. Experiments with low repetition rate benefit from the HydraHarp's multi-stop capability.

The design allows high measurement rates up to 12.5 million counts/sec per channel and provides a highly stable, crystal calibrated time resolution of 1 ps. Optionally, an external time base can be used. The instrument's timing resolution is well matched to SPAD detectors of the PDM Series or microchannel plate Photomultiplier Tubes (MCP). All input channels are equipped with Constant Fraction Discriminators (CFD), sensitive on the falling edge. A time-tagged mode for recording of individual photon events with their arrival time on all channels allows the most sophisticated offline analysis of the photon dynamics. Time-Tagged Time-Resolved (TTTR) data can also be correlated in real-time for monitoring of FCS experiments. In TTTR mode, the device can be synchronized with other hardware



such as scanners.

The HydraHarp software provides functions such as the setting of measurement parameters, display of results, loading and saving of measurement parameters and measurement curves. Important measurement characteristics such as count rate, count maximum, position and peak width are displayed continuously.

A comprehensive online help function shortens the users' learning curve. A library for custom programming e.g. with LabVIEW™ is also provided, both for Windows™ and Linux™.

Options

a) Small/large frame for up to 4/8 channels, b) Data analysis software

Specifications

| Input Channels and Sync | Constant Fraction Discriminator (CFD) |
|---------------------------------------|---|
| Input voltage range | 0 mV to -1000 mV, optimum: -100 mV to -500 mV |
| Trigger point | falling edge |
| Trigger pulse width | 0.5 to 30 ns |
| Trigger pulse rise/fall time | 2 ns max. |
| External Reference Clock | |
| Input | 10 MHz, min. 200 mV, max. 1 V pp, 50 Ohms, AC coupled |
| Output | 10 MHz, 300 mV pp, 50 Ohms, AC coupled |
| Time to Digital Converters | |
| Minimum time bin width | 1 ps |
| Electrical time resolution | < 12 ps rms |
| Full scale range - histogram mode | 65 ns to 2.19 s (depending on chosen resolution) |
| Full scale range - time-tagged mode | infinite |
| Maximum count rate per input channel | 12.5×10^6 counts/sec |
| Maximum sync rate | 150 MHz |
| Sustained throughput time-tagged mode | typ. 40×10^6 events/sec |
| Dead time | < 80 ns |
| Differential non-linearity | < 2 % peak, < 0.2 % rms |
| Histogrammer | |
| Count depth per time bin | 4.294.967.296 (32 bit) |
| Maximum number of time bins | 65536 |
| Collection time | 1 ms to 100 hours |
| Operation | |
| PC interface | USB 3.0 |
| PC requirements | 1 GHz min. CPU clock, 1 GB memory |
| Operating system | Windows™ 7/8/10 |
| Power consumption | small frame < 50 W, large frame < 100 W at 100 to 240 VAC |



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