

TDS

MenloSystems

Timing Distribution and Synchronization System



KEY SPECIFICATIONS

- Actively Stabilized Timing Links
- Timing Jitter: <10 fs RMS
- Timing Drift: <10 fs RMS
- Timing Link Length: <10 km
- Modular Design
- Integrated Out-of-loop Delay Line
- Automatic Locking

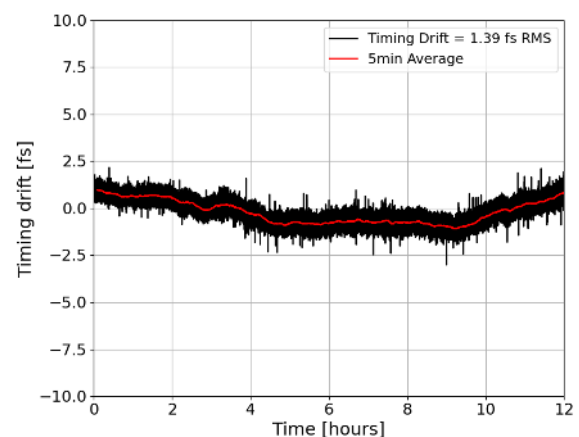
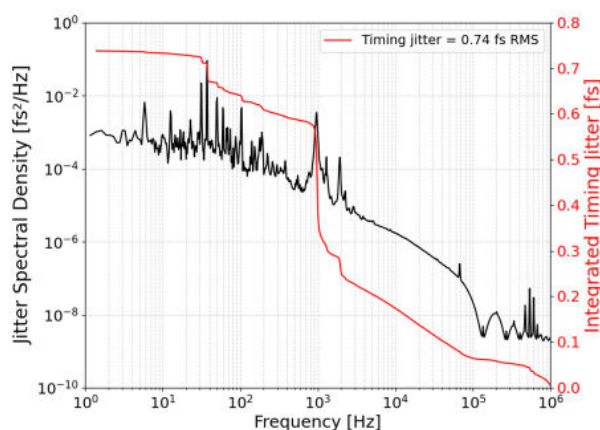
The Timing Distribution and Synchronization System (TDS) distributes stable optical frequencies and time markers to synchronize optical and RF oscillators in large scale facilities. The system is fully integrated and remotely controllable. An ultralow noise laser, based on Menlo's robust and reliable figure 9[®] fiber mode-locked oscillator technology, is used as the Optical Master Oscillator (OMO) which is synchronized to a low-noise RF oscillator or a cavity-stabilized CW laser to obtain optimum phase noise performance both close to and far away from the carrier. The signal from the laser is amplified using our Source Distribution Amplifier (SDA), and split up using our fully in-fiber Splitter Box into the required number of ports. The pulsed, stable laser signal is then distributed across the customer facility using our Stabilized Fiber Link (SFL) units to remotely synchronize lasers or RF systems with unprecedented overall precision and stability. Optionally, the receiver ends can be equipped with balanced optical cross-correlators (BCC-PD), balanced optical-to-microwave phase detectors (BOM-PD) or a drift-free Pulse-Per-Second (PPS) generator with programmable frequency and delay. With all components such as the laser system, optics parts, electronics, and RF generation manufactured by Menlo Systems, the TDS is a single-vendor solution allowing close interaction between customer and manufacturer for fast and efficient system integration.

APPLICATIONS

- Optical Timing Distribution over Large Distances
- Synchronization of Distributed Optical and RF Oscillators
- Free-electron Lasers
- Particle Accelerators
- Radio Antenna Arrays

MEASUREMENT DATA

Out-of-loop timing jitter and long-term timing drift measured after a 1 km fiber link:



Timing Distribution and Synchronization System

OPTICAL UNIT

Added timing jitter (short term)*	<10 fs	integrated, [0.1 Hz, 500 kHz]
Added timing drift*	<10 fs	RMS over 8 hours
Fiber link length	<10 km	
Fiber links per TDS platform**	up to 7	upgradable anytime to 14
Output type at backend	optical and RF	
Optical power per client	>10 mW	
Optical wavelength	1560 nm	
Design pulse repetition rate	50 - 250 MHz	to be specified prior to system order
Dimensions of one TDS platform enclosure	1156 x 986 x 182 mm ³	
BCC-PD at backend	optional	for optically locking an ultrafast laser oscillator to output of timing link
BOM-PD at backend	optional	for locking a voltage-controlled RF oscillator to output of timing link
Drift-free pulse-per-second (PPS) distribution	optional	PPS output at system's backend with programmable frequency and delay; two independent channels
RF signal outputs at backend***	optional	low-noise RF signals at 5, 10 and 100 MHz; phase coherent to the optical pulses
GHz-signal extraction at backend**	optional	low-noise, low-drift RF signal with frequency in the range of 1 - 6 GHz
Ambient temperature requirement	20 – 25 °C	
Ambient temperature variation requirement	±1 °C	for full specifications

SYSTEM ELECTRONICS

System control electronics	included	19" rack housing
Length of connector cables to optical units	max. 6 m	
Integrated feedback	included	SYNCR0-RRE for locking of the OMO to the RF reference
Control system interfaces	USB/Ethernet	
Auto lock	included	
Ambient temperature requirement	15 – 25 °C	
Ambient temperature variation requirement	±1 °C	for full specifications

*Stability and drift determination in-house and on user site

**5 links with integrated out-of-loop delay lines, upgradable to a total of 11 links

***Please contact us for further details

