Ref No. 2023-24/11 (PR No. 1000033780)   **(Rfx No. 6100001488)**

Technical Specification of Diode Laser Driver for Picosecond Pulse

The following items are required for time domain diffuse correlation spectroscopy system. The specification as per our requirement have been mentioned against each item.

1.Diode Laser Driver for Picosecond Pulse

Internal oscillator

Type	crystal locked
Operation mode	pulsed or continuous wave (CW)
Base frequencies	80 MHz, 1 MHz (selectable)
Repetition frequencies	user selectable: 1, 1/2, 1/4, 1/8, 1/16, 1/32 of base frequency 80, 40, 20, 10, 5 or 2.5 MHz 1000, 500, 250, 125, 62.5 or 31.25 kHz
Low jitter	< 20 ps (FWHM), typ. 3-5 ps (FWHM)

External Trigger Input

Amplitude	-5 V to +5 V (maximum limits)
Trigger level (adjustable)	-1 V to +1 V (negative slope)
Required pulse width	> 5 ns
Delay	trigger input to optical output1: typ. 35 ± 5 ns , jitter < 20 ps

Frequency range	Single shot to 80 MHz
Impedance	50 Ohms (dynamic) 50 Ohms (static)
Connector type	BNC socket (female)

Synchronization Output

Amplitude	< -800 mV into 50 Ohms (NIM)
Pulse width	6 ns
Delay	12 ns (from falling edge to laser output), jitter < 20 ps
Internal impedance	50 Ohms
Connector type	SMA socket (female)

Gating inputs

Slow gate	transition time < 100 ms (pulsed and CW operation)
Internal impedance	> 500 Ohms
Connector type	4-pin LEMO Socket - 00.304 Series Example of connector: FGG.00.304.CLA
Fast gate	transition time typ. 10 ns (pulsed only)
Internal impedance	50 Ohms
Connector type	1-pin LEMO Socket - 00.250 Series Example of connector: FFA.00.250.NTA

2. Laser Head

Beam parameters

Wave Length	780nm
Power	10-15mW
Optics focus length	f' = 4.5 mm
Numerical aperture	0.55
Typical divergence (with optics)	Theta parallel Typ. 0.11 mrad Theta perpendicular Typ. 0.32 mrad
Beam shape	Elliptical shape, typ. dimensions 1.5×3.5 mm
Polarization	typ. linear, perpendicular to the longer axis of the elliptical beam
Polarization Extinction Ratio (PER)	typ. $> 1{:}10$ (> 10 dB)
Side mode suppression ratio (SMSR)	typ. < 0.01

Cooling

Peltier cooling stability	better than 1 K for ambient temperature between 15 and 30 °C

3. Single-photon avalanche diode (SPAD)

Photon detection efficiency

@ 780 nm >= 15%

Dark counts

SPAD sensor diameter	50 µm
Dark count	<= 25 cps

Single Photon Timing Resolution

Counting output, TTL signal (FWHM)	250 ps
Timing output, NIM signal (FWHM)	down to 50 ps, increases in blue/UV spectral range

Input/ Output

Dead time	77 ns (typical)
Output signal	TTL for counting output and NIM for timing output
Output pulse rise and fall times	< 2 ns on 10 pF load
Output pulse duration	20 ns (typical)

Gating input	TTL control (low level gates detector off)
Supply input connector	standard 3.5 mm supply socket

4.

a. Multi-mode optical fibre.

This should be compatible with Single-photon avalanche diode (SPAD).

Specification:

- 50 µm core diameter
- Length – 2.0 m

b. Attenuators: This should be compatible with Single-photon avalanche diode (SPAD) and must reduce the signal strength to protect the SPAD sensor.

Specification: 10dB

5. Time-Correlated Single Photon Counting (TCSPC)

Input Channels and sync	Constant level trigger on all inputs, software adjustable
Number of detector channels	4
Input voltage operating range	-1200mV to 1200mV
Input voltage maximum range	±2500 mV
Trigger edge	Falling or rising edge, software adjustable
Trigger pulse width	>0.4 ns
Trigger pulse required rise/fall time	≤ 20 ns

Time to Digital converters

Minimum time bin width	5 ps
Timing precision*	<45 ps rms
Timing precision/ √2*	<32 ps rms
Dead time	<650 ps (can be increased via software up to 160 ns in steps of 1 ns)
Maximum sync rate (periodic pulse train)	1.2 GHz
Adjustable programmable time offset for each input channel	±100 ns, resolution 5 ps
Differential non-linearity	< 10 % peak, < 1 % rms (over full measurement range)

Histogrammer

Count depth	32 bit (4 294 967 295 counts)
Maximum number of time bins	65 536
Full scale time range	327 ns to 2.74 s (depending on chosen resolution: 5, 10, 20, …, 41 943 040 ps)
Acquisition time	1 ms to 100 hours
Peak count rate per input channel	1.5×10^9 counts/sec for burst durations up to 1.3 µs
Total sustained count rate, sum over all input channels	166×10^6 counts/sec (4P and 8P) 332×10^6 counts/sec (16P)

TTTR Engine

T2 mode resolution	5 ps
T3 mode resolution	5, 10, 20, …, 41 943 040 ps
FiFo buffer depth (records)	134 217 728 events
Acquisition time	1 ms to 100 hours
Peak count rate per input channel	1.5×10^9 counts/sec for burst durations up to 1.3 µs
Sustained count rate per input channel	78×10^6 counts/sec
Total sustained count rate, sum over all input channels	80×106 counts/sec

Warranty: - 01 Year.