FLIM LABS Fiber-Coupled Picosecond-Pulsed Laser Module Manual

1. Introduction

This manual describes the safe installation, operation, and maintenance of the FLIM LABS fiber-coupled picosecond-pulsed laser module. These compact, standalone modules are engineered for fluorescence lifetime imaging and spectroscopy, providing short light pulses down to 50 ps with peak powers up to 150 mW across visible and near-infrared wavelengths – Figure 1.

Figure 1 - FLIM LABS laser modules

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2. Safety Precautions

Laser Classification

Figure 2 - CLASS 3B Laser Product classification

This product is a Class 3B laser in accordance with IEC 60825-1. Direct or specular reflections of the beam can cause immediate eye injury; diffuse reflections are generally less hazardous but may present risks at high power levels.

Required Protective Measures

- Always wear laser safety eyewear rated for the module's wavelength and optical density.
- Equip the laser area with key-switch interlocks and warning signage labeled "Class 3B Laser."
- Do not look directly into the emitted beam or any reflections; permanent eye injury or blindness may result.

Owner/Operator Responsibilities

Ensure all personnel are trained in Class 3B laser hazards and safety procedures, and designate a Laser Safety Officer per national regulations.

3. Unpacking and Inspection

Upon receipt, verify the following items:

- Fiber-coupled picosecond-pulsed laser module (single-mode FC/PC)
- Wall-mount DC converter (9 V DC, 1 A max)
- SMA-to-SMA coaxial cable (laser sync out/in)

- USB-Type-C LVDS signal cable (proprietary sync interface)
- FC/PC multimode or single-mode fiber patch cord

Inspect for shipping damage. If any item is missing or damaged, contact FLIM LABS support immediately.

4. System Overview

Optical Output: FC/PC single-mode fiber connector, 4 µm core – Figure 3.

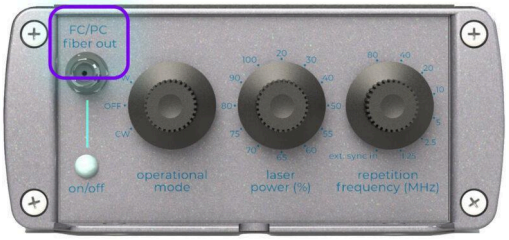

Figure 3 - FC/PC fiber connector

Power Input: 9 V DC via 2.1 × 5.5 mm coaxial jack or jumper cables – Figure 4

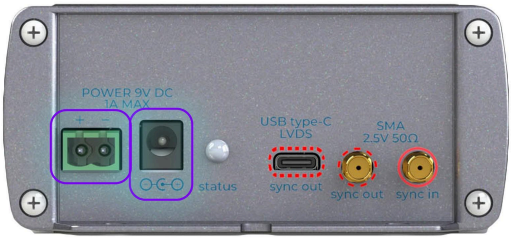

Figure 4 - Power connections

Trigger I/O (Figure 5):

- Sync Out: LVTTL 2.5 V @ 50 Ω (SMA)
- Sync Out: LVDS via USB-C
- Sync In: LVTTL 2.5 V @ 50 Ω (SMA) – Place knob on Ext. Sync. In.

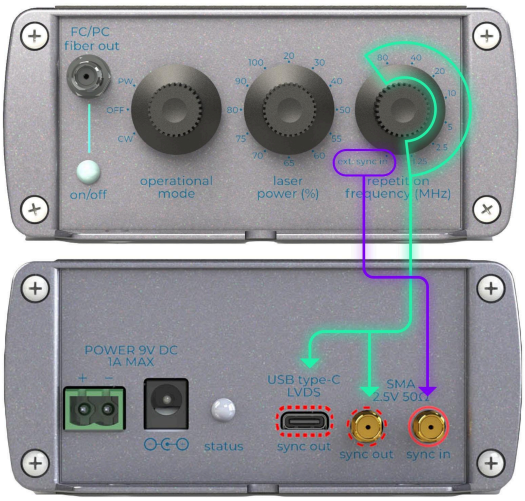

Figure 5 - Trigger I/O modalities

Dimensions: 135 × 110 × 50 mm; Weight: 510 g – Figure 6

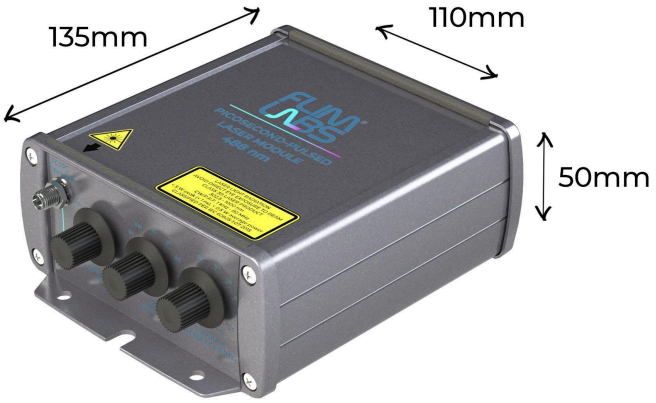

Figure 6 - Laser module dimensions

5. Installation

Location: Place on a stable, level bench free from excessive vibration and dust.

Environment: Standard laboratory conditions (avoid direct sunlight, high humidity, or corrosive atmospheres).

Power Connection: Connect the provided DC converter to the module's 9 V input. Verify polarity before powering on.

Fiber Connection: Inspect and clean the FC/PC connectors before mating. Gently insert the patch cord until it "clicks."

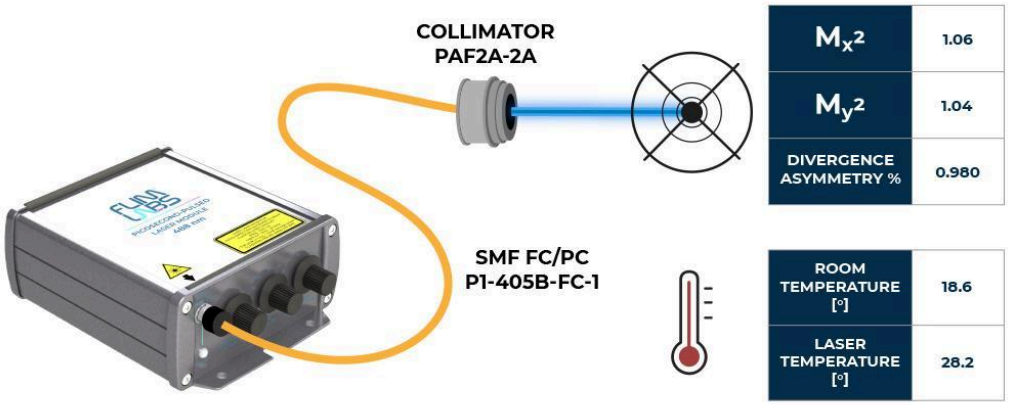

Figure 7 - Example of fiber and collimator and laser beam parameters

6. Electrical and Trigger Connections

Internal Triggering: Selectable fixed repetition rates: 80 MHz, 40 MHz, 20 MHz, 10 MHz, 5 MHz, 2.5 MHz, 1.25 MHz – Figure 8.

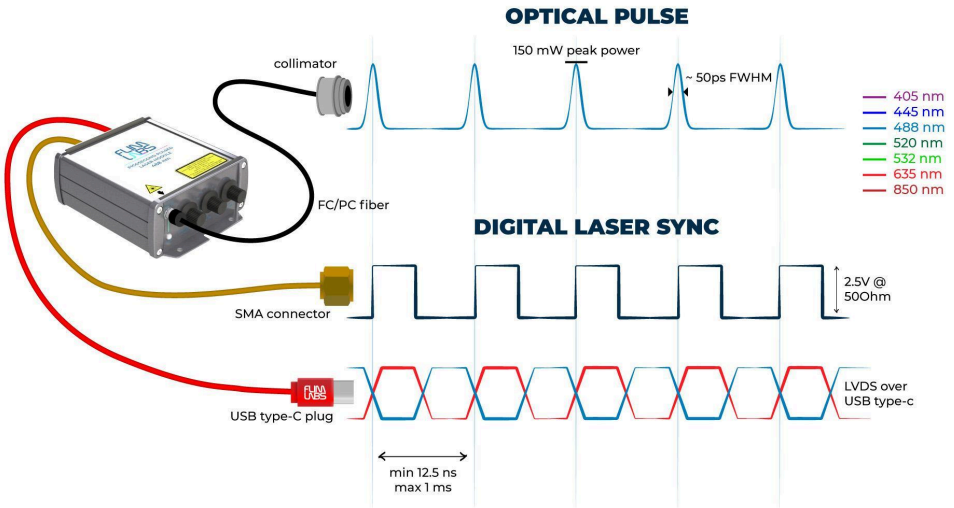

Figure 8 - Laser Sync out signal with Internal triggering

External Triggering: 1 kHz – 80 MHz via SMA (LVTTL) or USB-C (LVDS).

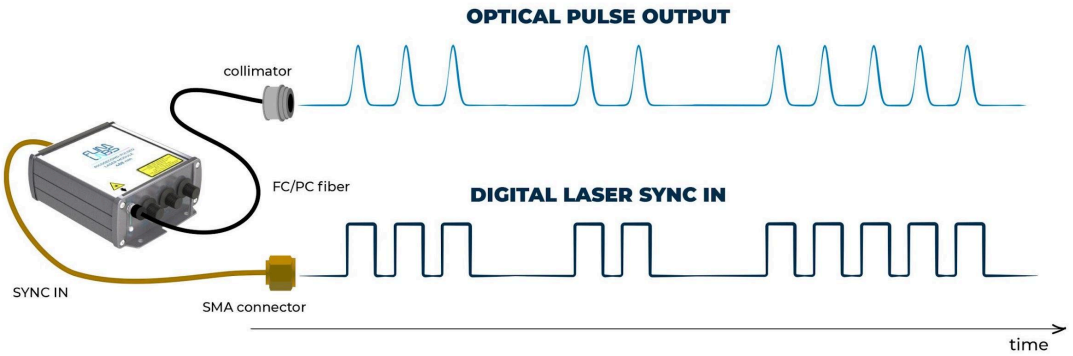

Figure 9 - External triggering functionality

Sync Output: Use the SMA sync-out for synchronization with TCSPC or FLIM acquisition cards.

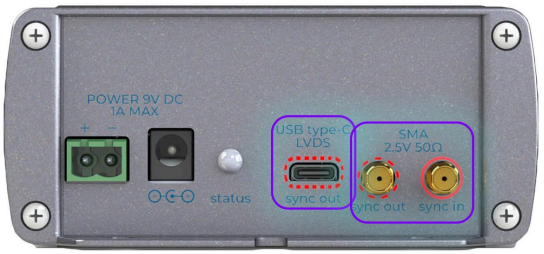

Figure 10 - Sync Out and Sync In connections

Grounding: Ensure all equipment shares a common earth ground to minimize noise and protect against electrical faults.

7. Operation

Power On: With interlocks engaged and eyewear donned, apply 9 V DC. Module LEDs will indicate readiness.

Selecting Trigger Mode: For internal operation, set the internal–external selector. For external operation, feed a clean, 2.5 V logic-level pulse into the trigger-in SMA.

Beam Delivery: Confirm fiber routing avoids sharp bends (< 30 mm radius). Use beam dumps or shutters to terminate the beam when not in use.

LED Indicators:

- Steady Green: idle, internal trigger ready (2)

Flashing Green/Blue: pulsed operation active (1)

Figure 11 - Operational LEDs

8. Maintenance and Care

Fiber Connector Cleaning: Use lint-free wipes and isopropyl alcohol on end-faces before connection.

Housing: Wipe external surfaces with a soft, dry cloth.

No User-Serviceable Parts: Do not open the module; all repairs must be performed by FLIM LABS certified technicians.

9. Troubleshooting

Issue	Possible Cause	Remedy
No laser output	Power not applied / Interlock open	Verify DC connection and status LED
Fiber disconnected	Loose connector	Check and reseat FC/PC connector

Erratic pulse or no sync	Improper trigger signal	Confirm LVTTL/LVDS levels and cable integrity
Excessive back-reflection	Dirty fiber or connector misalign	Clean connectors; adjust fiber alignment

10. Specifications

Wavelengths: 405, 445, 488, 520, 532, 635, 850 nm

Spectral Width: ± 10 nm

Pulse Duration (FWHM): Down to 50 ps (wavelength-dependent)

Peak Power: Up to 150 mW

Average CW Power (80 MHz): > 1 mW

Repetition Rate: Internal: 1.25 – 80 MHz; External: 1 kHz – 80 MHz

Jitter (RMS): < 4 ps

Dimensions: 135 × 110 × 50 mm

Weight: 510 g

11. Warranty and Support

For service, repairs, or spare parts, contact FLIM LABS S.r.l. at support@flimlabs.com. All modules carry a 12-month limited warranty.