

## Frequently Asked Questions for Fiber Phase Shifter

1. Q: What are the key characteristics of the fiber phase shifter? Are there any moving parts?

A: General Photonics' All Fiber Phase Shifters achieve optical phase modulation directly on a section of optical fiber. No optical waveguides or fiber pigtailed are used. There is no epoxy in the optical path. The standard model is polarization independent, although polarization-maintaining versions are available. The GP Phase Shifter uses no mechanical moving components.

2. Q: Is the phase shift independent of the modulation frequency of the input light?

A: The amplitude of the phase shift depends only on the applied voltage. It is independent of the data modulation rate of the optical signal. The dependence on the input light wavelength is very small unless the input light is from a very broadband source.

3. Q: Can the phase shifter be controlled with a DC drive voltage? What is the maximum phase shift possible?

A: The maximum phase shift is  $8\pi - 15\pi$ . A DC control voltage can be used to achieve the desired phase shift. It is recommended that a closed loop feedback system be used for high accuracy phase control.

4. Q: What is the maximum frequency of operation for your All Fiber Phase Shifter to generate a half-wave phase change at 1550 nm? What are the required drive voltages?

A: The  $V\pi$  range is 10-20 Volts at operating frequencies of 0-20 kHz. Some resonant peaks exist at frequencies >20kHz. A function generator can be used as a voltage driver.

5. Q: Is the All Fiber Phase Shifter bi-directional?

A: Yes, the fiber phase shifter is bi-directional.

6. Q: Is a driver board available for the Fiber Phase Shifter?

A: The PCD-001 or MPD-001 can be used as a driver for the fiber phase shifter.

## Frequently Asked Questions for Optical Delay Lines

### Motorized/Manual Optical Delay Lines (MDL/VDL)

1. Q: Is there any special gas in the variable delay line package that might influence interferometer applications?

A: There is no special gas in the standard package.

2. Q: What is the minimum (zero-state) delay of the manual variable optical delay line?

A: The minimum delay is on the order of 170 picoseconds, excluding contributions from pigtailed. Each meter of the fiber pigtail will add approximately 5 nanoseconds to the delay. The standard manual delay line has a scale that reads in millimeters, with a movable vernier. The increments on the vernier correspond to 0.1 mm, which is equivalent to approximately 0.67 ps delay.

3. Q: What is the delay per turn for the manual delay lines?

A: It is about 1.8 ps/turn for single-pass models, and about 3.6 ps/turn for double-pass models.

4. Q: How much fiber is in the delay line? How much dispersion is expected to occur?

A: The actual optical delay path is mostly free space, so dispersion effects should be minimal. If dispersion is a concern, the fiber pigtail length can be minimized.

5. Q: Is driver software available for the motorized delay line?

A: There is no control program, but a remote control command list is provided in the user manual. Windows HyperTerminal or a similar program can be used to send ASCII code to the RS-232 serial port for delay control.

6. What is the operating wavelength range for the MDLs and VDLs?

A: The standard operating wavelength range for SM MDLs and VDLs is 1260-1650 nm. For the PM versions, the operation bandwidth is limited by that of the PM fiber, and is typically

around 1450-1680 nm.

7. Q: Is there a separate encoder output enabling tracking of MDL position without using serial commands?

A: This can be done. Please request it when ordering.

8. Q: Are the variable delay lines bidirectional?

A: Yes.

9. Q: What are the principal differences between the MDL/VDLs and the programmable optical delay generator (ODG)?

A: The MDLs and VDLs provide continuous optical delay variation of up to 1200 ps, with a free-space optical path. The ODG provides digitally variable optical delay of up to 250 $\mu$ s (double pass), with a fiber delay path.

### Time Delay Coils

10. Q: What is the fiber length tolerance of the compact time delay coils?

A: The length tolerance is

- $\pm 0.3$ m for coil length <200m
- $\pm 1$ m for 200m < coil length < 1000m
- $\pm 2.5$ m for 1000m < coil length < 5000 m

Fiber length is typically tested by OTDR.

11. Q: What are typical fiber coil dimensions?

A: Inside coil diameter can be 2.25, 2.75, 3.0, or 3.5 inches. Generally, coils of <2.5 km will have an inside diameter of 3.5". Coil height is typically 35mm. The outside coil diameter depends on the fiber length. Other dimensions may be available by special request.