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FIBER POLARIZATION CONTROLLER - FPC560

GENERAL DESCRIPTION:

This Polarization Controller utilizes stress induced birefringence to create three (3) independent fractional "wave plates" to alter the polarization in single mode fiber. Single mode fiber is looped into three (3) independent spools, creating three independent fractional "wave plates" (fiber retarders). The amount of birefringence induced in the fiber is a function of the fiber cladding diameter, the spool diameter (fixed), the number of fiber loops per spool, and the wavelength of the light. (NOTE: the desired birefringence is induced by the loop in the fiber, not by the twisting of the fiber paddles). The fast axis of the fiber, which is in the plane of the spool, is adjusted with respect to the transmitted polarization vector by manually rotating the paddles.

If one wishes to transform an arbitrary input polarization state into an arbitrary output polarization state, a combination of three (3) paddles (a 'quarter wave plate', a 'half wave plate', and a 'quarter wave plate') would be the desired configuration. The first 'quarter wave plate' would transform the input polarization state into a linear polarization state. The 'half wave plate would rotate the linear polarization state, and the last 'quarter wave plate' would transform the linear state into an arbitrary polarization state. Therefore, adjusting each of the three paddles (fiber retarders) allows complete control of the output polarization state, over a broad range of wavelengths (500 - 1600nm).

A plot of retardation per paddle versus wavelength is shown in Figure A for a fiber with a cladding diameter of 125μm. The retardation, in radians, is plotted for 1, 3, and 6 loops per paddle. The variable d1 is the fiber cladding diameter and λ1 is the wavelength. For a fiber with a core diameter of 80μm, the retardation per paddle versus wavelength is shown in Figure B

SPECIFICATIONS:

Paddle Material:	Black Delrin
Loop Diameter:	2.2" (56mm)
Paddle Rotation:	±117.5 Degrees
Foot Print (W x L):	1.0" x 12.5"

SET-UP:

1) Remove the Top Caps at each end of the Fiber Polarization Controller (FPC).
2) Position the Paddles horizontally so that the groove loops are facing up, and the straight part of the grooves are aligned with the grooves in the top of the paddle supports of the base.
3) Lay the fiber in one end of the FPC and continue to lay the fiber along the grooved path, with the number of desired loops per paddle, until the fiber is through the other end of the FPC. The fiber should be in contact with the inside of the groove loops, but not be pulled too snug against the groove as this will cause optical losses due to induced birefringence as the paddles are rotated with respect to each other.

   NOTE: The ends of the FPC is designed to 'clamp' onto 3mm diameter protective tubing. If the fiber placed into the FPC does not have protective jackets, pieces of a soft material, such as foam, can be inserted into the end caps to prevent the fiber from loosening in the paddles. The fiber should be held 'gently' enough so that the fiber does not draw into the FPC, but there should be minimal force applied to the fiber such that additional birefringence is not induced.

4) After the FPC is assembled, the laser light should be launched into one end of the fiber. This can be accomplished with one of our Fiber Launch Systems, or our Cage Plate accessories with Collimation package or Single mode Grin Optic Collimator.

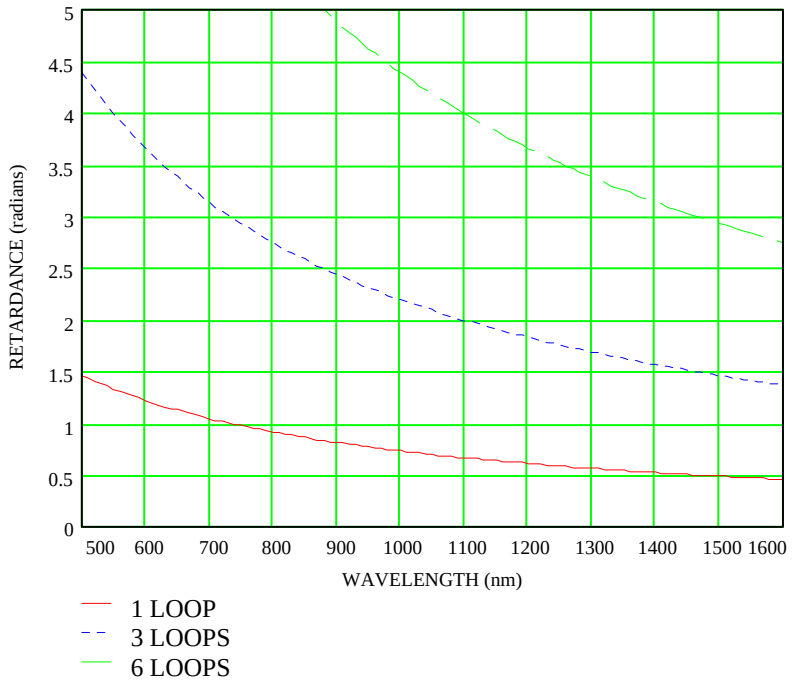

FIGURE A
Retardation vs. Wavelength for 1, 3, and 6 Fiber Loops Per Paddle.
The Fiber Clad Diameter is 125µm.

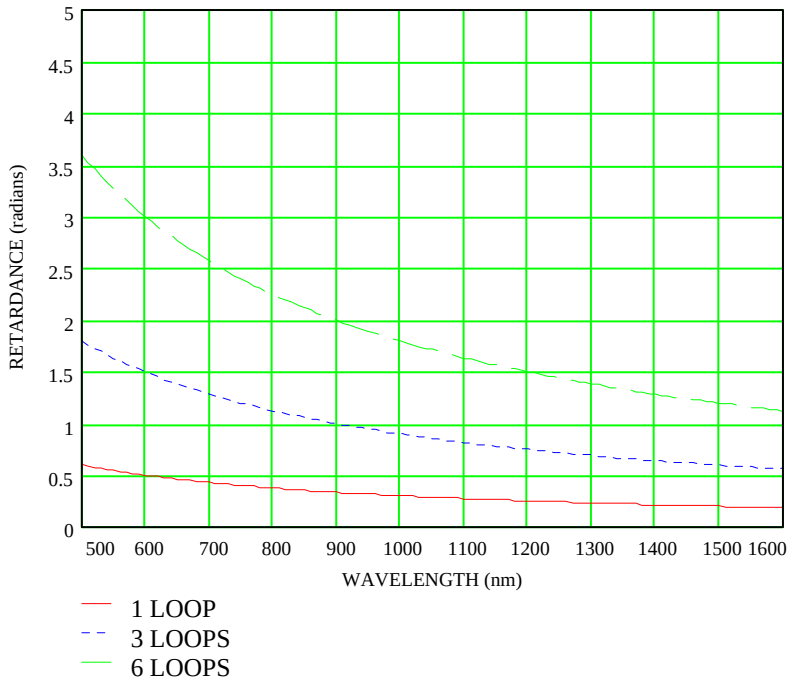

FIGURE B
Retardation vs. Wavelength for 1, 3, and 6 Fiber Loops Per Paddle.
The Fiber Clad Diameter is 80µm.