

Lightvision

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Lightwaves2020's High-Speed Products with PM Fiber are Now Available!

Lightwaves2020 introduces polarization maintaining fiber (PMF) option for our high-speed product line, namely the High-Speed Polarization Controller (HS-PC), the High-Speed Polarization Rotator (HS-PR), the High-Speed Variable Optical Attenuator (HS-VOA), and the Polarimeter (PRIMC), in addition to Liquid Crystal (LC) based products of LC-PC and LC-VOA (Figure 1).

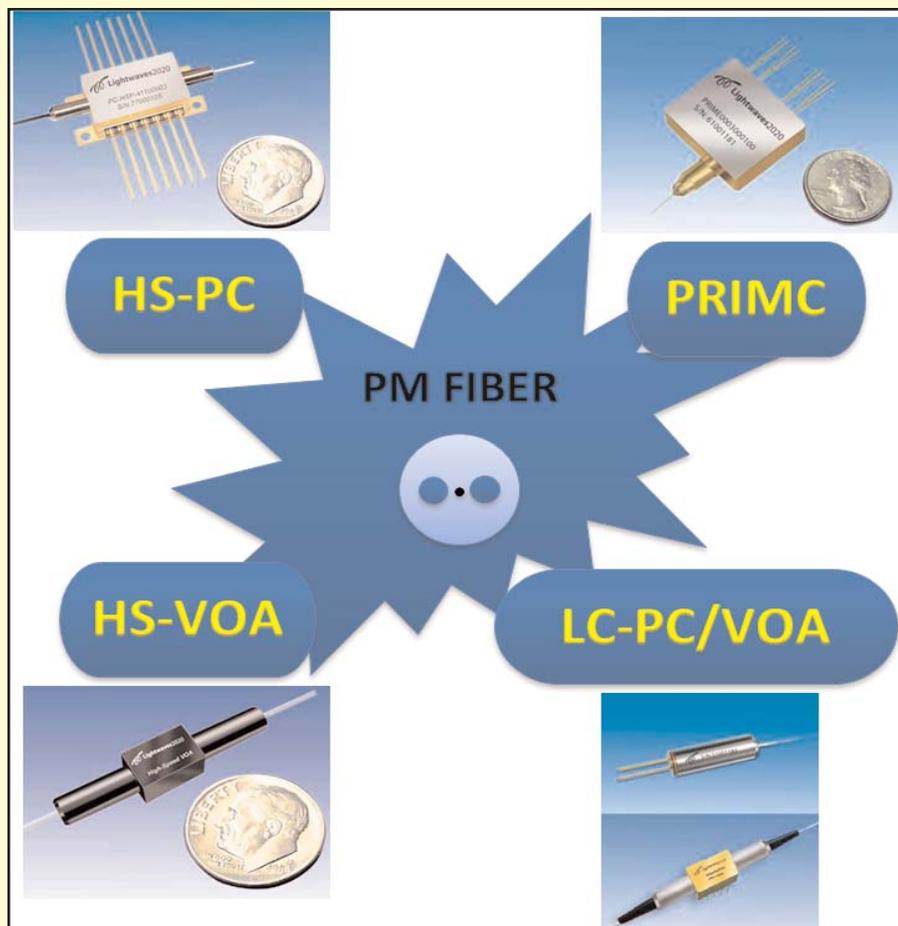


Figure 1: Lightwaves2020's High-Speed Products with PM Fiber

Application of PMF

The use of single mode fiber (SMF) is limited for applications where polarization maintenance is a major concern. The addition of PMF in a fiber system significantly increases the assurance of polarization state and degree in the presence of mechanical stress, small bending radii, and other environmental perturbations. In contrast to SMF, PMF has large intrinsic birefringence, much greater than any stress-induced birefringence, and this allows for the maintenance of polarization. Commonly, linearly polarized light is aligned with PMF of the Panda type such that the launching condition can be matched to the fiber's slow or fast axis (Figure 2). Connection of PMF to other optical components in a fiber system such as connectors, other PMF, and optical devices, requires sensitive alignment techniques to ensure low-loss and polarization maintained performance. This level of performance is crucial for applications such as fiber sensors based on polarization control, fiber interferometry, and polarization division multiplexed optical transmission systems.

Lightwaves2020's PMF Advantage

Lightwaves2020's popular line of polarization products offers a distinct advantage for customers interested in accurately controlling and measuring polarization effects with high-speed and high-accuracy. The PMF option gives customers the added advantage of maintaining polarization more accurately throughout the entire fiber system. Lightwaves2020 has specialized expertise in the transmission and reflection (Figure 3) types of PMF connection with optical devices that allows for very low-loss, high polarization extinction ratio, high return loss, and high accuracy assembly of PMF-based products. Using passive and active PMF alignment methods, Lightwaves2020's new PMF option also provides customers with an added leverage in the quality of polarization maintenance and customization.

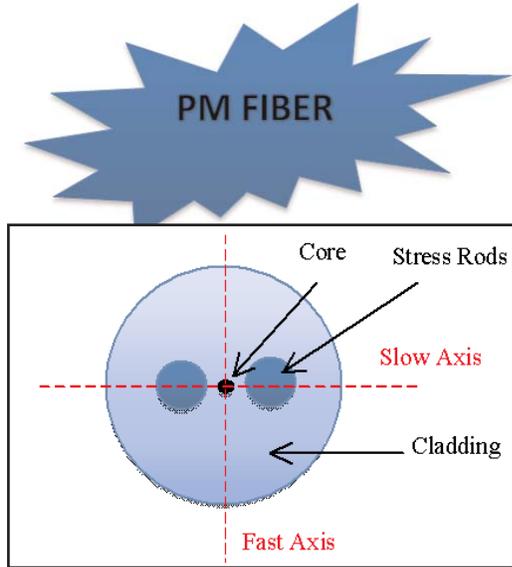


Figure 2: Panda Type PMF

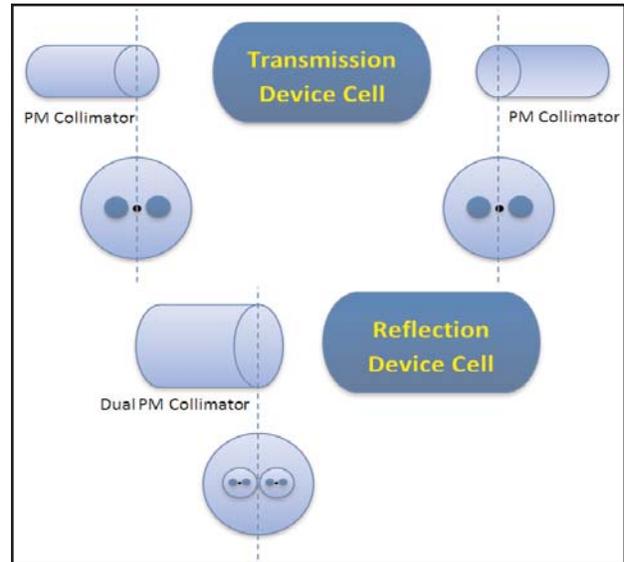


Figure 3: Transmission Type PMF vs. Reflection Type PMF

High-Speed Tunable Filter Voltage Drops to <100V!

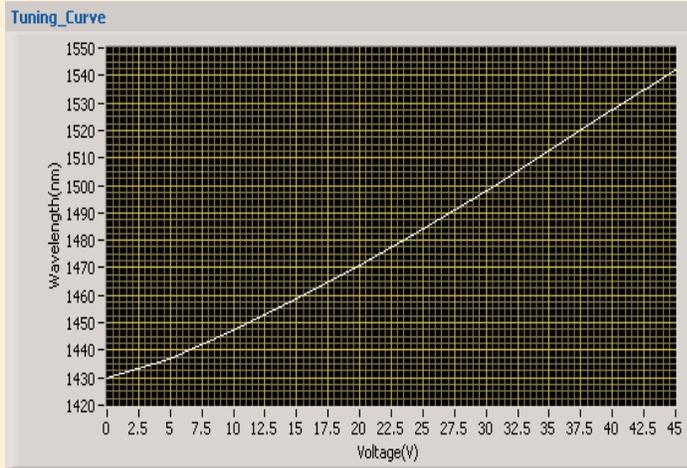


Figure 1: Typical Tuning Curve for Low-Voltage HS-TF

With novel assembly techniques, Lightwaves2020 successfully reduced the operating voltage of its High-Speed Tunable Filter (HS-TF) to <100V. The reduced control voltage will benefit system designers to integrate this module. Figure 1 is a typical tuning curve for the device with FSR= 100nm.

The speed for the low-voltage version of the HS-TF is slightly less than the standard high-voltage one. The scanning speed is > 500Hz. Figure 2 and Figure 3 are diagrams of the typical frequency responses of the device. With new assembly techniques, modules with Side-mode Suppression Ratios (SSR) > 30dB is also achievable.

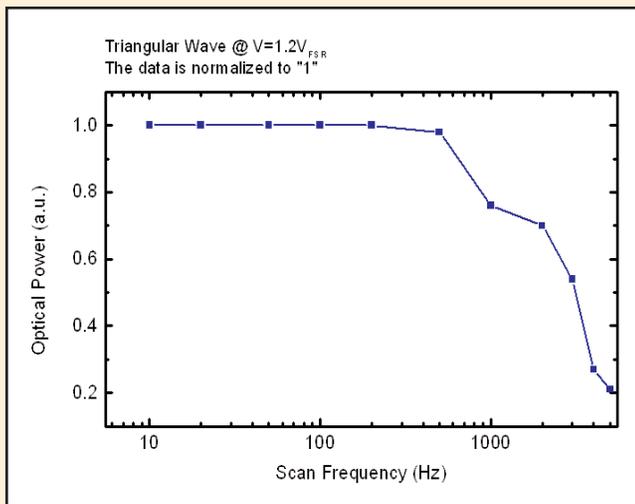


Figure 2: Scanning Speed for Low-Voltage HS-TF

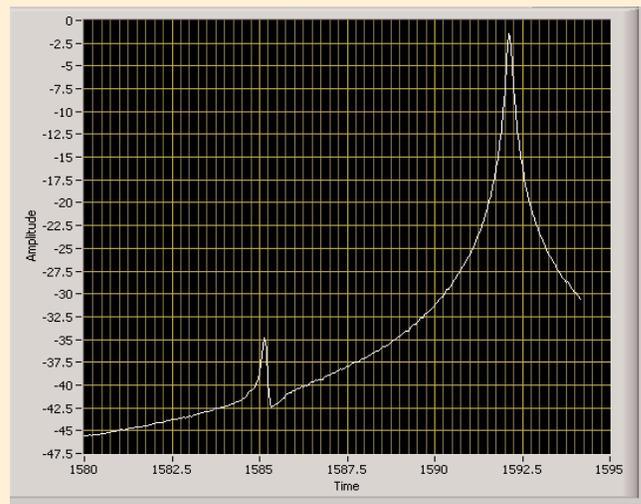


Figure 3: Typical Filter Spectrum

Control Method for Better Wavelength Stability

In general, when the control voltage is changed from V_1 to V_2 , the wavelength will **drift** for a certain period of time after the voltage reaches V_2 . The wavelength will experience red-shift if $V_1 < V_2$ and blue-shift if $V_1 > V_2$. In order to avoid the drift issue (or so-called overshoot/undershoot), oscillating voltage waveform around the target voltage is thus preferred. Figure 4 and Figure 5 illustrate two typical waveforms. The programmed time duration can be cut down to $100\mu\text{s}$ since the device response is very fast.

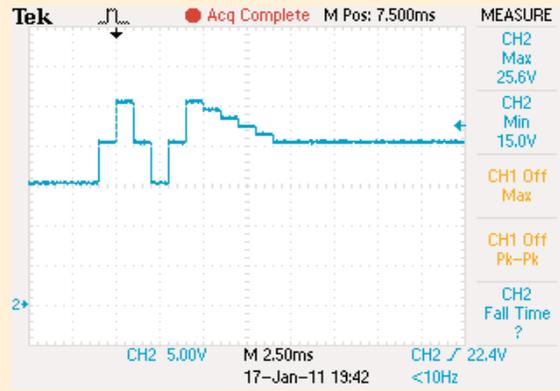
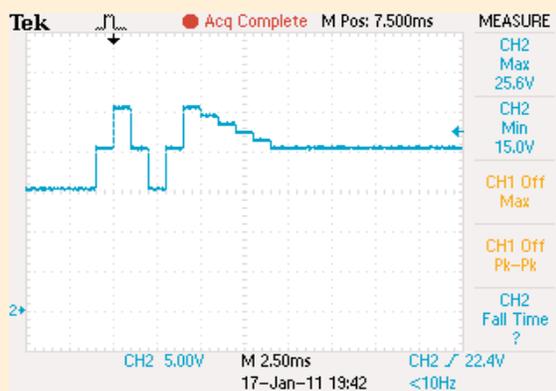


Figure 4: Left: $V_1 < V_2$; Right: $V_1 > V_2$

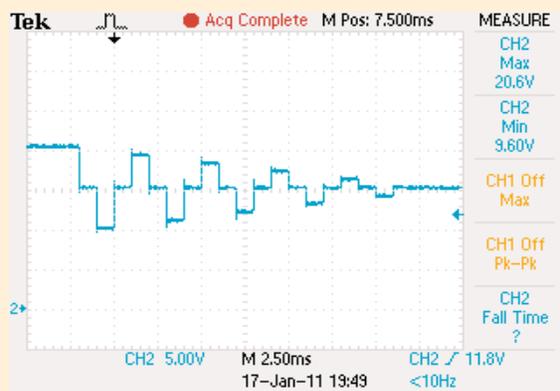
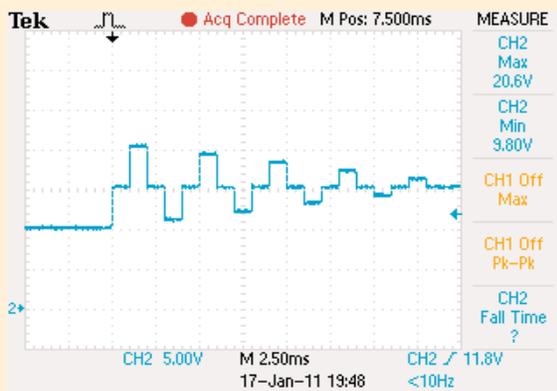


Figure 5: Left: $V_1 < V_2$; Right: $V_1 > V_2$

With the suggested oscillating waveform control, the wavelength should reach the stable state **within 10ms or sooner**. Figure 6 is the typical wavelength stability performance by using the recommended control voltage waveforms.

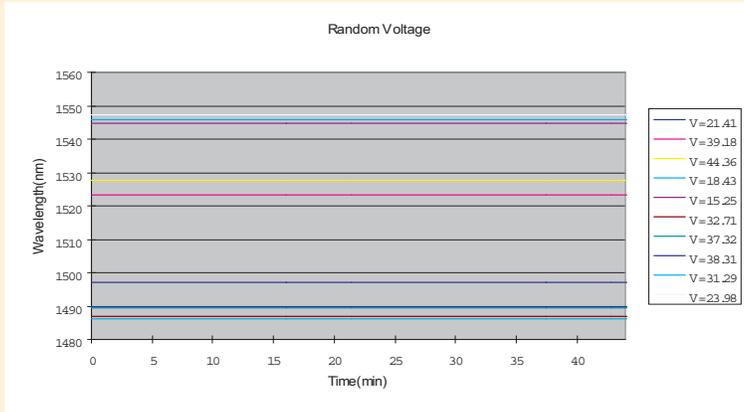


Figure 6: Wavelength Stability with Random Voltage Setting [Voltage setting method same as Figure 4]

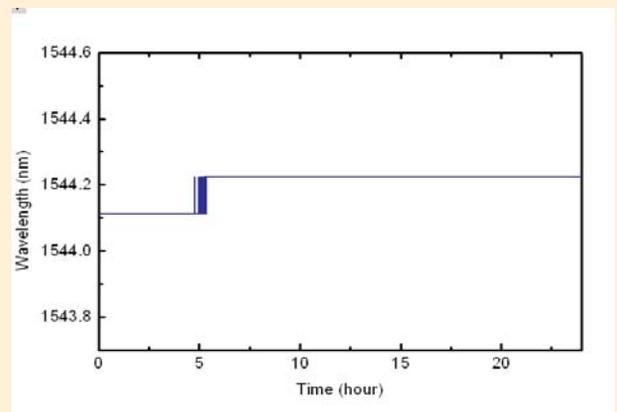


Figure 7: Long-Term Wavelength Stability with Bias Voltage

As for the long-term wavelength stability at a fixed control voltage and TEC control, the typical performance is $<0.15\text{nm}$ over 24 hours. (See Figure 7)

In order to help customers with their optical module evaluation, Lightwaves2020 also provides a driver with RS-232 interface. This can facilitate the product development stage on the customer side.

NEWSWIRE

Lightwaves2020 is setting new directions for partnerships in Europe, focusing on promoting our High-Speed product line. A number of European partners recently visited our facilities, and were much impressed by our complete in-house production capability and remarkable flexibility in customizing products to meet customers' needs. Moreover, conducting fiber assembly and fiber testing on site also enables us to maintain quality control each step of the way.

Most talked about were the High-Speed Tunable Filter (HS-TF) and the High-Speed Polarization Controller (HS-PC). The HS-TF is very powerful in optimizing high-speed applications to reach their full performance level; while the HS-PC is widely used in sensors for the purpose of expanding the range of sensing with a higher extent of accuracy and sensitivity.

We are proud that the visitors all left with confidence in our High-Speed products and that they strongly believe Lightwaves2020's sales outlook is very promising!



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