



# **User Manual**

## **NS-type Polarization Scrambler Module**

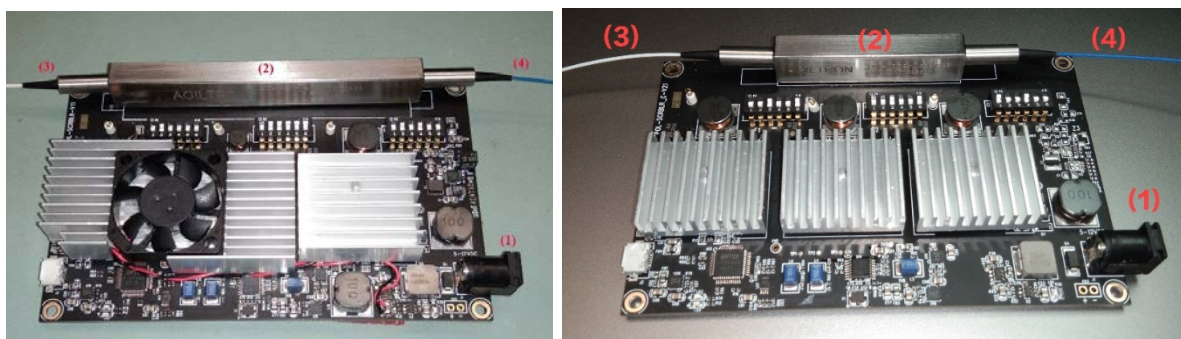
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## 1. Introduction

The NS-type fiber-optic polarization scrambler (**NOPS**) is based on a high-speed electro-optical (EO) material plate functioning as a phase retarder. Three EO plates are oriented at 0, 45, and 0 degrees, respectively. The three EO plates are driven at three different sinusoidal waves that are not synchronized. The driving board internally produces the sinusoidal waves.

NOPS has three versions currently, of which the maximum frequency is 5MHz, 2MHz, and 300kHz, respectively. Figure 1 shows the OEM type of NOPS on the driver.



|                                 |
|---------------------------------|
| 1. Power supply connector (12V) |
| 2. Polarization Scrambler       |
| 3. Optical Input                |
| 4. Optical Output               |

Figure 1: NOPS integrated modules. Left: 5MHz or 2MHz version; Right: 300kHz version

The instrument type of NOPS is currently available only for the 300kHz version, as shown in Figure 2, where the NOPS is packaged in one enclosure to minimize the external impact on the DOP performance.



Figure 2: Photo of NOPS in the enclosure

The NOPS is delivered with one 12VDC power supply.

## 2. Operation

This NOPS is a fully integrated module and ready to use. The user only needs to plug the power supply into DC port #1, as shown in Figure 1, the NOPS will automatically scramble the polarization of input light.

## 3. Performance

The performance of NOPS is finely-tuned at room temperature before shipment to ensure the **DOP** specified in the datasheet is met for all input polarization states. So, please **don't** change any pre-setting on the driving board.

Figure 3 shows the setup for a fine-tuning process by using a polarization controller (PC) and polarization analyzer.

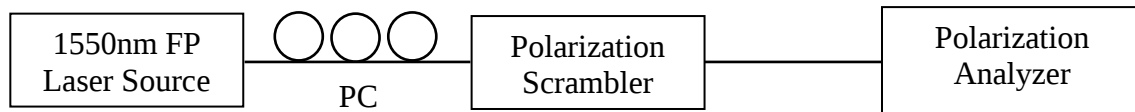


Figure 3: Performance Evaluation Setup

Figure 4 shows one example measurement using an HP polarization analyzer.

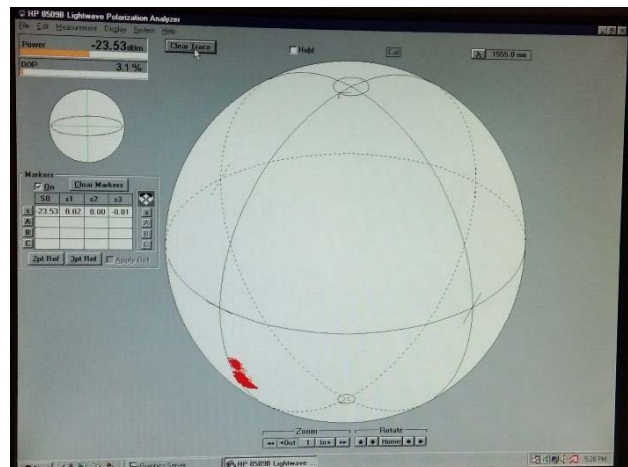


Figure 4: DOP measurement

## 3. Optical Specification

| Parameters                  | Min  | Typical | Max  | Unit |
|-----------------------------|------|---------|------|------|
| Operating wavelength range  | 1300 |         | 1600 | nm   |
| Insertion Loss              |      | 0.8     | 1.5  | dB   |
| Polarization Dependent Loss |      | 0.05    | 0.35 | dB   |
| Operating Temperature       | -5   |         | 70   | °C   |
| Storage Temperature         | -40  |         | 85   | °C   |
| Operating Optical Power     |      |         | 500  | mW   |

## 4. Warning

Do not touch the driving board during operation to avoid high voltage electric shock.