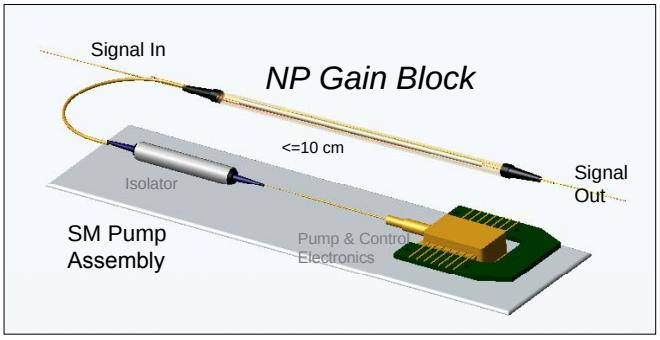
NP Photonics

Pencil Amplifier

Mini Erbium Doped Fiber Amplifier (Mini-EDFA)



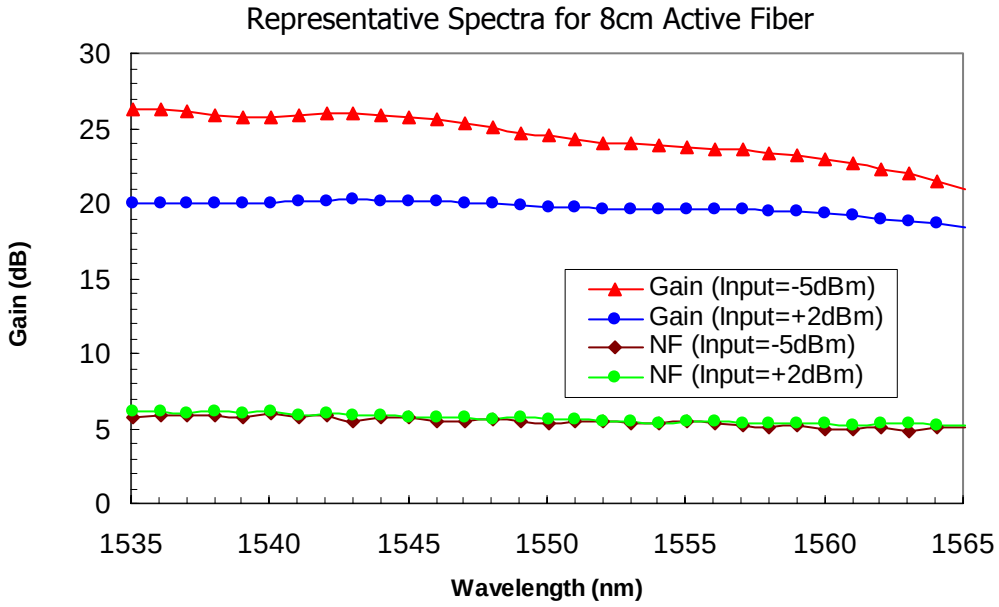
FEATURES

- High optical gain
- Low noise figure
- Very low latency
- C-band operation
- Integrated with pump lasers
- Compact suitable for integration
- Customizable gain element

NP Photonics fabricates its own glass and fiber, which gives tremendous flexibility of fiber design in terms of core diameter, NA, gain, dispersion, and nonlinearity. This is important for optimization of fiber amplifier and laser performance, and is particularly advantageous for designing a low noise amplifier.

APPLICATIONS

- Optical signal processing
- Interferometric sensing
- Distortion-free short optical pulse amplification
- Long haul networks
- Metropolitan networks
- Access networks
- Band amplifier
- Single channel amplifier
- Loss compensation for optical components



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PRODUCT Introduction

NP Photonics produces short-length (<10cm), low latency optical amplifiers with gain and noise figure performance comparable to standard EDFA devices. At the heart of this new amplifier technology is a specialized high gain per unit length glass and fiber. The active core elements are made from a phosphate glass host co-doped with erbium and ytterbium. The proprietary phosphate glass composition improves the solubility to erbium and ytterbium ions thereby allowing order of magnitude higher dopant levels than is possible in conventional silica fibers. This enables high gain per unit fiber length in the C-band wavelength band, and makes possible the short length and low latency amplifier.

The active fiber is integrated with micro-optic signal-pump couplers and spectral gain flatteners, and packaged into one self-contained amplifier device with fiber pigtails for input and output signals as well as fiber pigtails for optically pumping the doped fiber. The active fiber is energized by commercially available, fiber pigtailed, semiconductor pump diodes (also included).

The NP Photonics Mini-EDFA comes in two types: one is the pre-amplifier Mini-EDFA which provides a spectrally flat gain of over 20 dB in the 1535nm-1565nm wavelength region; the other is the Mini-EDFA power amplifier which delivers more than 20 dBm output power in the 1535-1565nm wavelength region. Both devices have a short latency – equivalent to less than 20 ps relative to a 10cm length of standard single mode fiber.

The development of this type of glass and optical fiber opens up new possibilities for extremely compact high performance optical amplifiers both for commercial and special applications where compact physical size and/or minimum signal latency are of paramount importance.

NP Photonics Active Fiber and Fiber Amplifier

Conventional erbium doped fiber amplifiers (EDFA) use erbium-doped silica fibers more than one meter long to achieve greater than 20 dB gain near the 1550 nm range. More commonly, the length of the erbium doped silica fiber is approximately 10 to 20 meters. In applications where short length (~ 1cm-10cm) is necessary, high gain per unit length of optical fiber becomes a critical requirement in order to obtain comparable amplifier performance in a reduced length. Standard erbium-doped glass provides a gain per unit length of only 0.02-0.2 dB/cm, which does not support sufficient gain in the needed compact form factor, and is not a viable choice for short length optical amplifiers or lasers.

NP Photonics' has developed high gain per unit length glass and fiber, and has extensive experience to use this fiber in commercialization of single frequency fiber lasers and short length optical amplifiers. To achieve the high gain per unit length, a new approach has been developed at NP Photonics using active core elements formed from a phosphate glass host co-doped with erbium and ytterbium. The phosphate glass composition improves the solubility to erbium and ytterbium ions thereby allowing order of magnitude higher dopant levels (i.e. 3-4% weight erbium concentration). This level of doping is higher than previously deemed practical without raising the up-conversion rate, which is deleterious to overall efficiency. The ytterbium co-doping greatly enhances the fiber's ability to absorb pump power while the elevated erbium levels enhance the gain per unit length of the fiber.

High gain per unit length fiber has been integrated with micro-optic lenses and filters for signal-pump couplers and spectral gain flatteners, and packaged into one self-contained amplifier device with fiber pigtails for input and output signals as well as fiber pigtails for optically pumping the doped fiber. Figure 1 shows a schematic representation of one such device we have fabricated containing 8 cm of active fiber length and completely packaged with micro-optic components within a 10 cm cylindrical tube. The active fiber is energized by commercially available, fiber pigtailed, semiconductor pump diodes (also included).

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Specifications subject to change without notice.