Highly Nonlinear Fiber Module (HiFi)

Summary: The Octave Photonics Highly Nonlinear Fiber (HiFi) product line generates broadband supercontinuum from a femtosecond laser input. The HiFi utilizes various nonlinear fibers to customize the output spectrum for specific applications. High conversion efficiency is achieved via low-loss splices (~0.5 dB) between the highly nonlinear fiber (HNLF) and standard polarization-maintaining fiber. The HiFi comes in two different form factors: a fully jacketed fiber for maximum ease of use, or a compact aluminum housing for ruggedized mounting.

HiFi modules feature FC/APC, polarization-maintaining fiber connectors. Available either as jacketed fibers (left) or housed within an aluminum enclosure (right). Pictures are not to scale.

Specification	HiFi
Input center wavelength	~1560 nm
Input pulse duration[1]	<200 fs
Input pulse energy	0.4 to 2 nJ (typical)
Input repetition rate	50 to 500 MHz (typical)
Output spectral range	1000 to 1800 nm (spectrum depends on nonlinear fiber)
Input/output fiber	PM1550, PM980, or custom **(as short as 5 mm!)**
Connector type	FC/APC, FC/PC, or custom
Nonlinear fiber length	0.01 to 10 meters (0.2 to 2 meters typical)
Form factor	Jacketed fiber (3 mm or 900 micron) or aluminum enclosure
Splice loss	<1 dB per splice, 0.5 dB typical
PM HNLF options	Standard: 1, 5, 8, -3 ps/nm/km, custom dispersion available

Features: The HiFi features several key innovations that make it particularly easy to use and versatile:

- Fully jacketed fiber is more durable than bare fiber and takes up less space than a spool.
- Ultra-low-loss PM1550 to HNLF splices provide ~0.5 dB loss, increasing efficiency.
- PM-fiber pigtail lengths can be as short as 5 mm, ensuring short pulses.
- Also available in a compact ruggedized metal enclosure for high-power applications.
- Full characterization of power-dependent spectrum.
- Available as a complete system with power amplifier and wavelength selective splitters.

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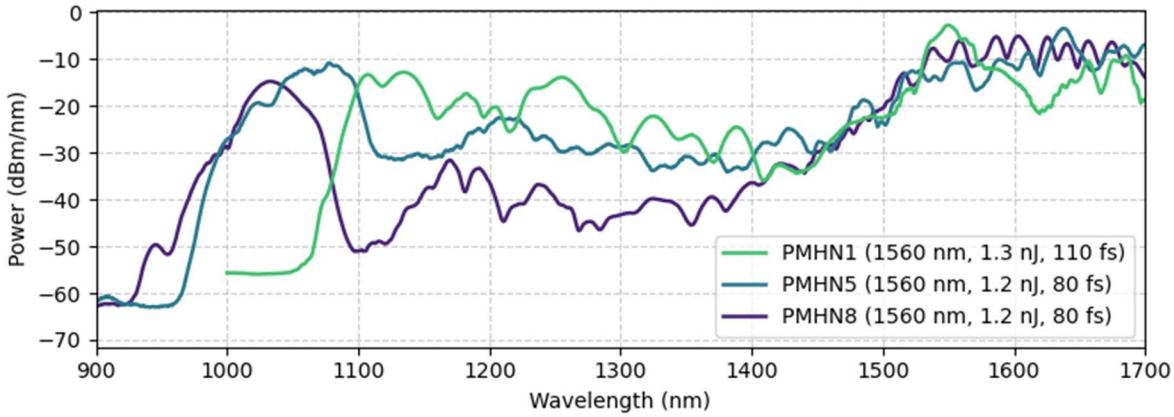
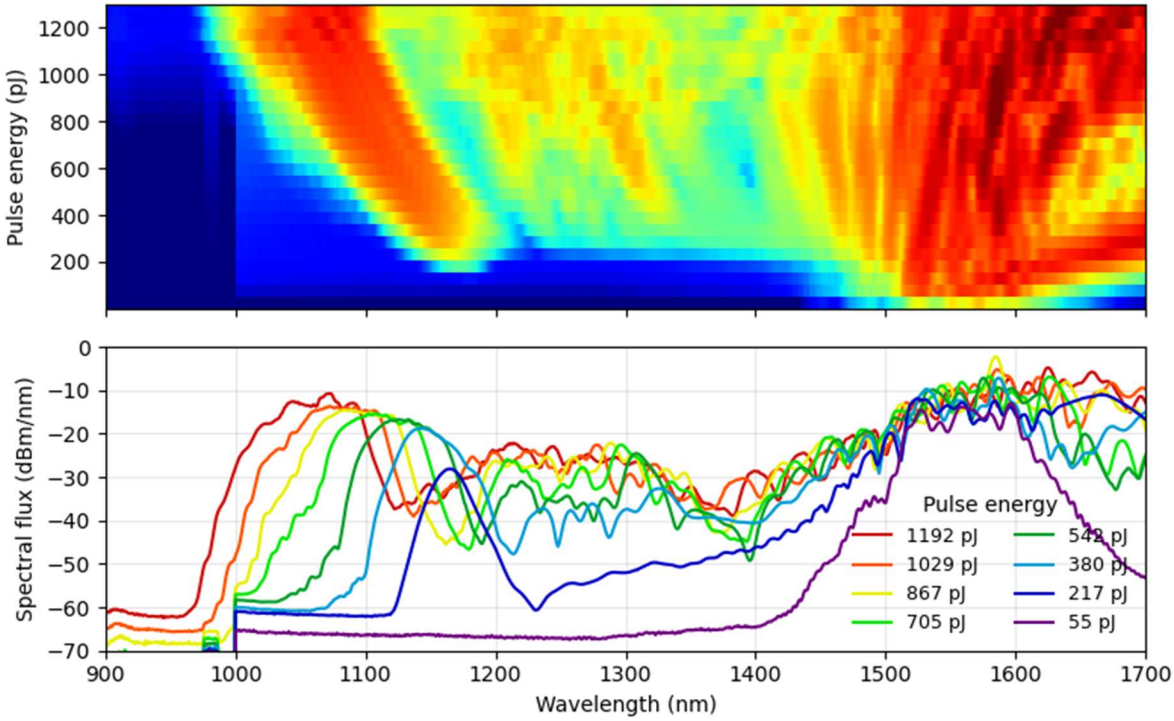
Fiber options: The HiFi can be manufactured using most 1550 nm highly nonlinear fibers (HNLFs). Anomalous-dispersion HNLF is the most common and is typically used for generating broadband spectra spanning several hundred nanometers. Normal-dispersion HNLF can provide carefully controlled broadening to several tens of nanometers, and it is often used to generate the additional bandwidth needed to compress ~1 ps pulses to ~100 fs.

Example spectra:



950 to 1450 nm generation from a 100 MHz femtosecond laser centered at 1560 nm. The length of each nonlinear fiber is 0.5m. At input pulse energies ~1 nJ, broadband light is generated with a peak at that can be shifted from 1000 to 1250 nm depending on the fiber type. Changes to the pulse duration and pulse energy of the input laser will also shift the output spectrum. (Note: output PM980 fiber partially attenuates wavelengths longer than 1550 nm. Alternative output fibers available on request.)



Supercontinuum generation in a 0.5 m long PMHN5 HiFi from a 100 MHz, 80 fs laser centered at 1560 nm.

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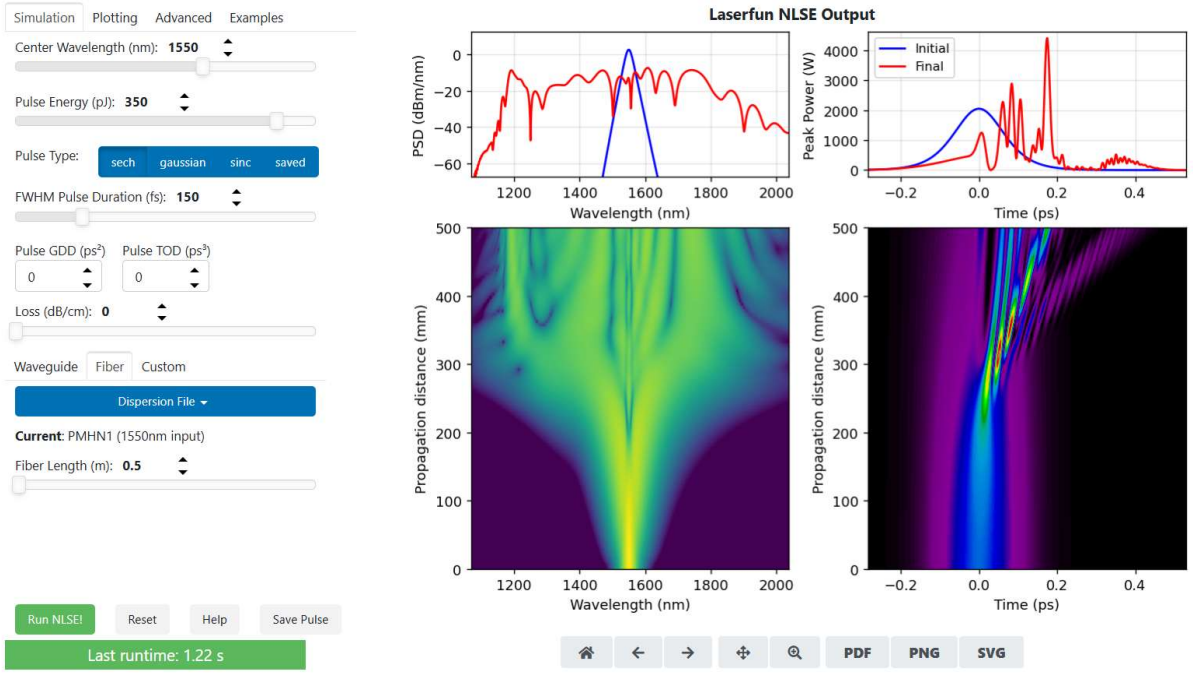
Which nonlinear fiber is right for you? Contact us and we can help you choose, or visit us at octavephotonics.com/nlse to simulate your target spectrum based on your laser inputs!



Usage: For best performance, pulse must be compressed at the start of the nonlinear fiber, accounting for dispersion of input fiber.

Want more control over the dispersion and higher nonlinearity? No problem. Check out Octave Photonics' Dispersion-Engineered Supercontinuum Module (DESMO) that uses custom nanophotonic waveguides to generate ultrabroad supercontinuum: octavephotonics.com/desmo

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