

Spirit-NOPA®

Broadly Tunable Optical Parametric Amplifiers
for 3-Photon Imaging in Neuroscience and
Other Ultrafast Scientific Applications



The Spirit-NOPA is a family of automated non-collinear optical parametric amplifiers (NOPA) specifically built and optimized for the industry-proven Spirit® and Spirit® One™ ultrafast lasers. The turn-key, high repetition rate Spirit femtosecond laser combines with the Spirit-NOPA to create a powerful, user-friendly tunable, high repetition rate source of ultrashort pulses for in-vivo, deep tissue imaging in neuroscience, spectroscopy, and other ultrafast scientific applications.

Spirit-NOPA-VISIR delivering unprecedented performance for 3-photon imaging:

In combination with our industry-proven Spirit platform, the Spirit-NOPA-VISIR provides an ideal platform for 3-photon excitation microscopy. Spirit-NOPA-VISIR comprises two amplification stages. The first amplification stage is non-collinear, which generates broad bandwidth, and the second amplification stage is collinear, which enables a broad tuning range.

Spirit-NOPA-VISIR provides a broadly tunable output of ultrashort pulses with a tuning range of 650 nm to 900 nm (signal) and 1200 nm to 2500 nm (idler), including key wavelengths for deep-tissue, 3-photon imaging. Optionally, the signal output can be compressed down to <70 fs using an external prism-based compressor unit, and the

Spirit-NOPA Advantage

Spirit-NOPA-VISIR:

- Repetition rate up to 4 MHz
- Pump power up to 70 W
- High pulse energy for 3-photon imaging
- Broad tuning range: 650 nm to 900 nm (signal), 1200 nm to 2500 nm (idler)
- Optional pulse compression: <70 fs (signal), <100 fs (idler)
- Dual pulse length option to bridge the gap in the tuning range

Spirit-NOPA (-2H, -3H, and -IR):

- High repetition rate, ultrashort pulses
- Wavelength range from UV to IR
- Integrated pulse compressor



Applications

- 3-photon excitation microscopy
- Single molecules studies
- Nanomaterials science
- Ultrafast surface dynamics
- Multi-dimensional spectroscopy

Spirit-NOPA

idler output down to <100 fs, using an integrated bulk compressor. When pumped by a Spirit ultrafast laser with up to 70 W and at a repetition rate of up to 4 MHz, the Spirit-NOPA-VISIR enables unprecedented performance for 3-photon imaging.

In order to bridge the tuning gap between 900 nm and 1200 nm, Spirit-NOPA-VISIR can optionally be configured with the Dual Pulse Length Option. With that it is possible to extend the tuning range of the Spirit-NOPA-VISIR to that of a conventional OPA closing the gap between signal and idler.

Spirit-NOPA-3H, Spirit-NOPA-2H, and Spirit-NOPA-IR for ultrashort pulses from UV to IR:

Spirit-NOPA-3H includes a built-in third harmonic generator and its output is tunable from 500 nm to 900 nm with a pulse width as short as sub-30 fs and an output energy up to >0.5 μJ .

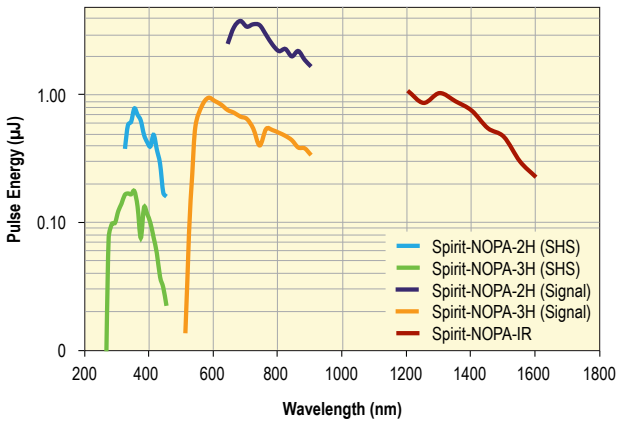
Spirit-NOPA-2H includes a built-in second harmonic generator, to convert the Spirit IR beam to 520 nm. The output of the Spirit-NOPA-2H is tunable from 650 nm to 900 nm with a pulse width as short as sub-30 fs and an output energy up to >3 μJ .

Spirit-NOPA-IR includes a built-in second harmonic generator and its output is tunable from 1200 nm to 1600 nm with a pulse width as short as sub-80 fs and an output energy up to >0.6 μJ .

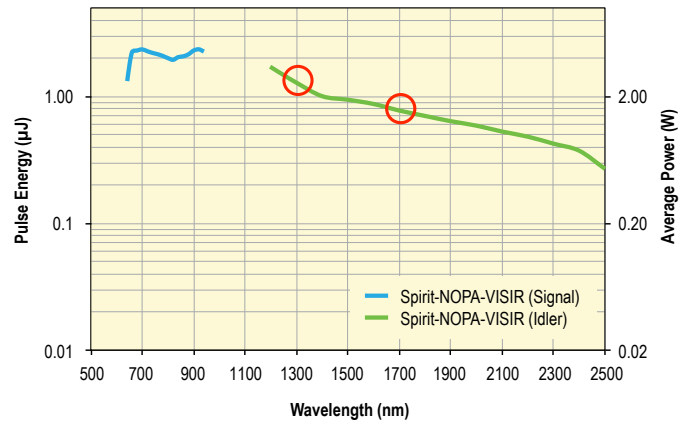
Spirit-NOPA is fully computer controlled to allow for easy wavelength tunability. Its built-in bandwidth selector and integrated computer controlled compressor provide a pulse width agility unmatched by other ultrafast laser technologies.

Spirit-NOPA

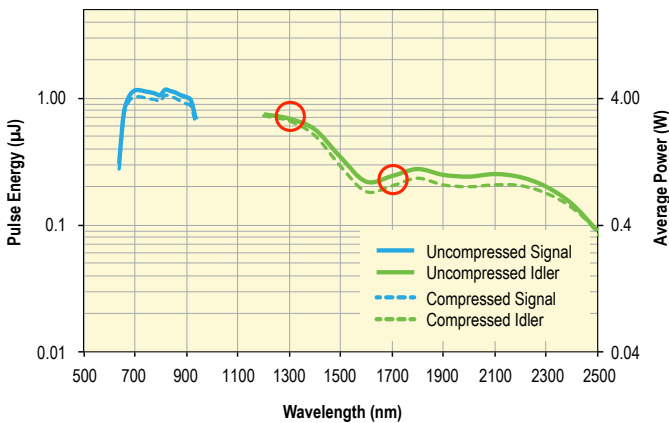
Typical Spirit-NOPA Performance¹
(Spirit pump pulse energy 40 μJ , Compressed Output)



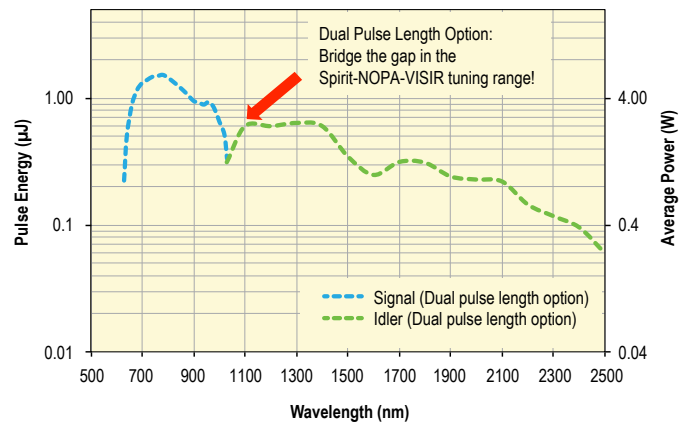
Typical Spirit-NOPA-VISIR Performance¹
(Pumped by a Spirit 1030-70 at 60 W and 2 MHz)



Typical Spirit-NOPA-VISIR Performance¹
(Pumped by a Spirit 1030-70 at 70 W and 4 MHz)



Typical Spirit-NOPA-VISIR Performance with Dual Pulse Length Option¹
(Pumped by a Spirit 1030-70 at 70W and 4 MHz. Uncompressed Output)

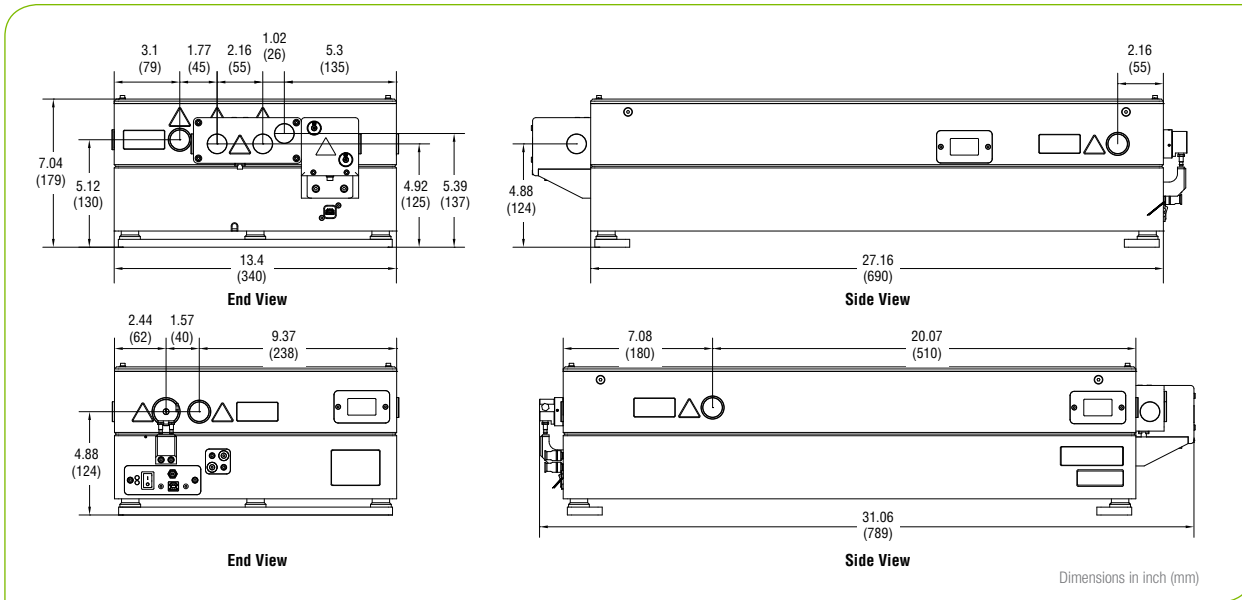


1. Typically measured performance; not a guaranteed or warranted specification.

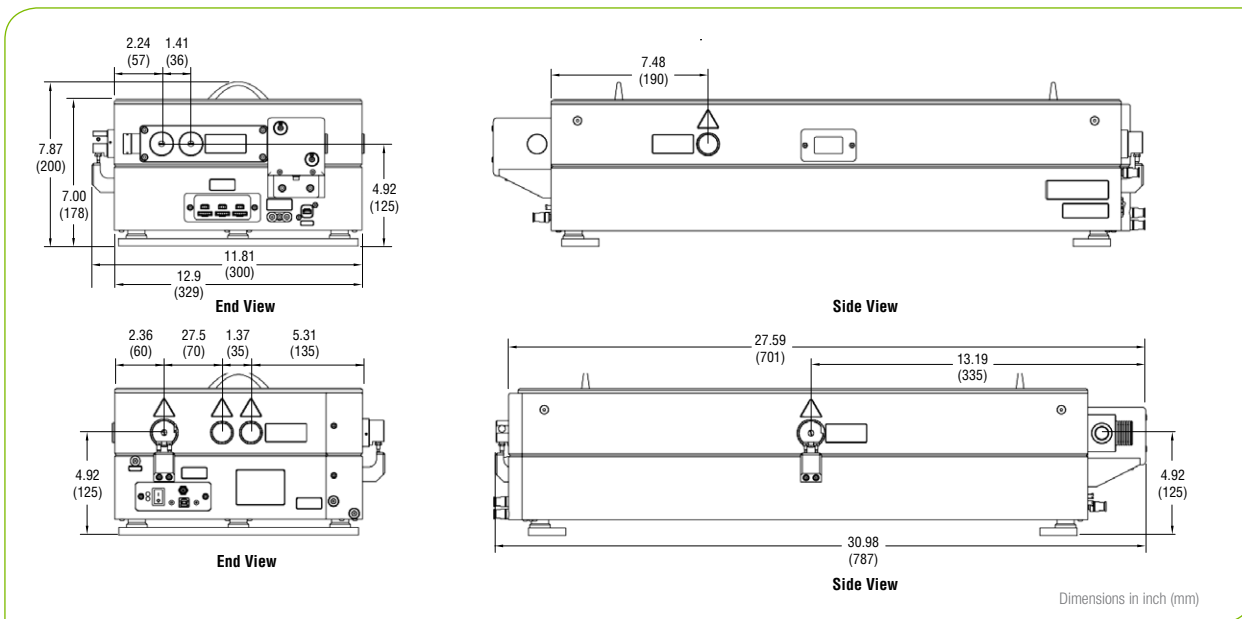
Spirit-NOPA Typical Performance¹

	Spirit-NOPA-3H	Spirit-NOPA-2H	Spirit-NOPA-IR
Output Specifications			
Tuning Range	500–900 nm	650–900 nm	1200–1600 nm
Pulse Energy ²	0.5 μ J at 580 nm (peak); 0.25 μ J at 700 nm	3 μ J at 700 nm (peak); 1.2 μ J at 850 nm	0.6 μ J at 1300 nm; 0.3 μ J at 1500 nm
Pulse Width	<30 fs at 530–670 nm; <80 fs at 670–800 nm	<30 fs at 700–850 nm	<80 fs at 1200–1600 nm
Optional SHG Output			
Tuning Range	250–450 nm	325–450 nm	600–800 nm
Pulse Energy ²	0.05 μ J at 290 nm (peak)	0.3 μ J at 350 nm (peak)	0.06 μ J at 650 nm
Pump Requirements⁴ from Spirit			
Repetition Rate	Single shot to 1 MHz		
Wavelength	1030 nm or 1040 nm		
Pulse Energy ⁵	12–120 μ J	10–120 μ J	10–120 μ J
Max. Input Power	8 W	8 W	16 W

Spirit-NOPA



Spirit-NOPA-2H, -3H, and -IR Dimensions



Spirit-NOPA-VISIR Dimensions



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