

**UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS**

Omni Continuum LLC,

Plaintiff,

v.

**NKT Photonics Inc. and
NKT Photonics A/S,**

Defendant.

Case No. 1:24-cv-11007-IT

**PLAINTIFF’S PRELIMINARY PATENT-RELATED
DISCLOSURES**

Pursuant to Local Rule 16.6, Plaintiff Omni Continuum LLC (“Omni”) makes the following disclosures:

A. Infringement Claim Charts.

Infringement claim charts identifying, with as much specificity as reasonably possible from publicly available information or other information then within the patentee’s possession, custody, or control:

(i) each accused product;

The Accused Lasers are:

- All lasers in the SuperK FIANIUM laser series sold since 2018, including but not limited to models FIW-6, FIW-6+, FIW-12, FIU-6, FIU-15, FIR-20, FIU-6 OCT, FIR-9 OCT, WL-SC-400-15, WL-SC-400-40, WL-micro.
- All lasers in the SuperK EXTREME laser series sold since 2018, including but not limited to models EXW-12, EXU-6, EXB-6, EXR-4, EXR-6+, EXR-15, EXR-20, EXW-4 OCT, EXU-6 OCT, EXR-9 OCT.

(ii) the patent(s) and the claim(s) each product allegedly infringes;

U.S. Patent No. 7,433,116: Claims 1–4, 9, 12–14, 16, 19, 20, 22–24.

U.S. Patent No. 7,519,253: Claims 1–8.

(iii) an element-by-element description of where and how each element of each asserted claim is found in each accused product;

See Attachment 1—Claim Charts.

(iv) as to each element that the patentee contends is a means-plus function term under 35 U.S.C. § 112, the identity of the structures, acts, or materials in the accused product(s) or method(s) that perform the claimed function;

None.

(v) whether each element of each asserted claim is asserted to be present literally or under the doctrine of equivalents;

Literal.

(vi) which subsections of 35 U.S.C. § 271 apply; and

§ 271(a)

(vi) if any alleged infringement is based on the acts of multiple parties, the role of each such party in the infringement.

N/A.

B. Prosecution History.

Copies of the prosecution histories for each asserted patent, including any parent applications and provisional applications from which the asserted patents descend and to which each asserted patent claims priority. The patentee shall also produce any non-privileged documents in its possession, custody, or control concerning the conception and reduction to practice of the

invention claimed in the asserted patents, including but not limited to lab notebooks (electronic or otherwise).

Omni produced the file histories for the asserted patents at bates range OMCN000078-2193. A conception document for U.S. Patent No. 7,519,253 is produced at bates numbers OMCN002219 and OMCN002320. Omni possesses a privileged draft patent application submitted to Omni's patent counsel, which demonstrates a conception date for U.S. Patent No. 7,433,116 on July 15, 2003. In the event reliance on the draft patent application becomes necessary following disclosure of NKT's invalidity contentions, Omni will consider whether it is necessary to waive privilege on that draft. At the present time, however, there is no basis for Omni to waive its attorney-client privilege on that document.

The filing of the patent applications for the '116 Patent and the '253 Patent (provisional) constitute constructive reduction to practice of those inventions, as reflected in the file histories produced herewith.

C. Ownership Evidence.

Documents (including, without limitation, any licenses or assignments) sufficient to establish that the patentee owns the asserted patent(s) or has the authority to assert the patent(s).

See Bates Nos. OMCN002194-217.

D. Real Parties in Interest.

Documents sufficient to establish the identity of all real parties in interest as to the patentee and the asserted patent(s).

See Bates No. OMCN002218.

Date: August 14, 2024

Respectfully submitted,

/s/ Thomas A. Lewry
Thomas A. Lewry (*Pro Hac Vice*)
John S. LeRoy (*Pro Hac Vice*)
Christopher C. Smith (*Pro Hac Vice*)

BROOKS KUSHMAN P.C.

150 W. Second St., Suite 400N

Royal Oak, MI 48067-3846

Telephone: (248) 358-4400 / Fax: (248) 358-3351

Email: tlewry@brookskushman.com

jleroy@brookskushman.com

csmith@brookskushman.com

LAW OFFICE OF

MICHAEL C. MOSCHOS

Michael C. Moschos (Bar #357420)

770 Salisbury Street, Unit 572

Worcester, MA 01609

Telephone: (508) 753-8993 / Fax: (508) 753-8996

Email: lawofficemcm@gmail.com

Attorneys for Omni Continuum LLC

CERTIFICATE OF SERVICE

I certify that I served:

PLAINTIFF'S PRELIMINARY PATENT-RELATED DISCLOSURES

on August 14, 2024 by:

X delivering (via email: philip.hanaka@bipc.com; todd.walters@bipc.com; andrew.cheslock@bipc.com; grant.shackelford@bipc.com; robert.wagner@bipc.com)

— mailing (via First-Class mail)

a copy to:

Philip M. Hanaka (#644673)
BUCHANAN INGERSOLL & ROONEY PC
401 East Las Olas Boulevard, Suite 2250
Fort Lauderdale, Florida 33301

Todd R. Walters (*pro hac vice*)
Andrew R. Cheslock (*pro hac vice*)
Grant S. Shackelford (*pro hac vice*)
BUCHANAN INGERSOLL & ROONEY PC
1737 King Street, Suite 500
Alexandria, Virginia 22314

Robert L. Wagner (*pro hac vice*)
BUCHANAN INGERSOLL & ROONEY PC
Union Trust Building
501 Grant Street, Suite 200
Pittsburgh, PA 15219-4413

*Attorneys for Defendant
NKT Photonics Inc.*

/s/ Nicole L. Chevalier _____

U.S. PATENT NO. 7,433,116

L.R. 16-6(d)(1)(A)(iii) Element-By-Element Description of Where and How Each Element of Each Asserted Claim is Found in Each Accused Product

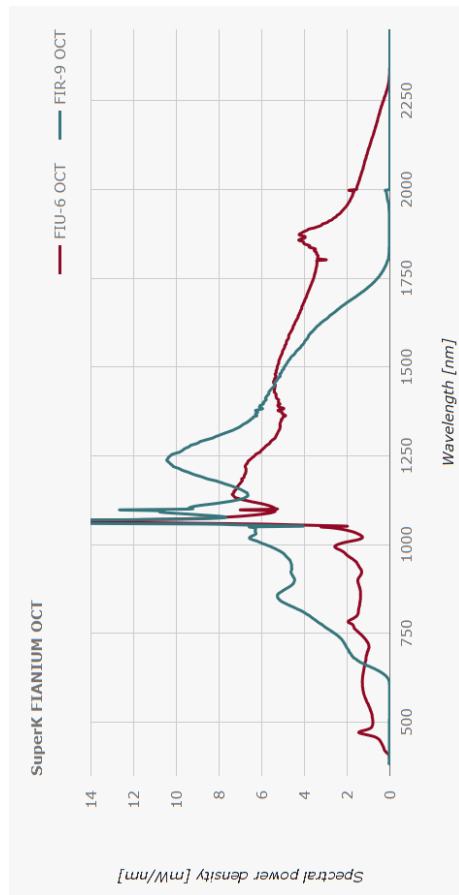
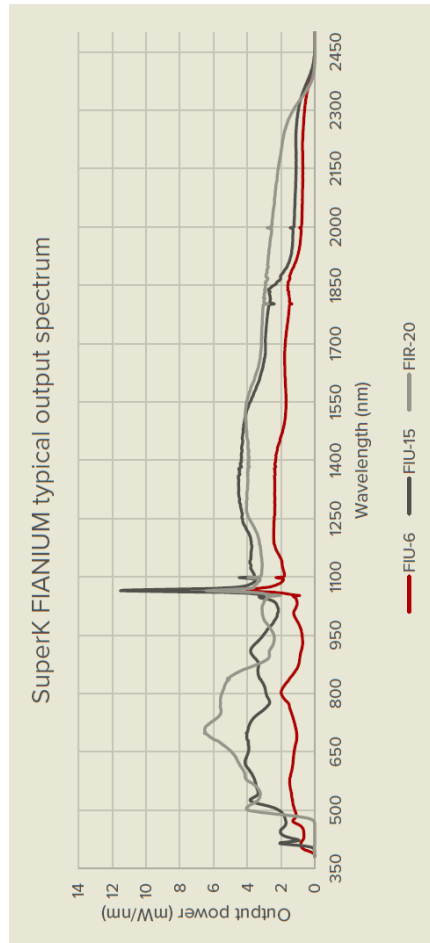
Omni makes these claim charts with as much specificity as reasonably possible from publicly available information or other information then within its possession, custody, or control. These contentions also rely on Dr. Islam's knowledge and understanding of supercontinuum lasers.

Omni contends that all Accused Lasers meet the limitations below in substantially the same way, so this claim chart applies to all Accused Lasers unless specified otherwise.

CLAIM 1

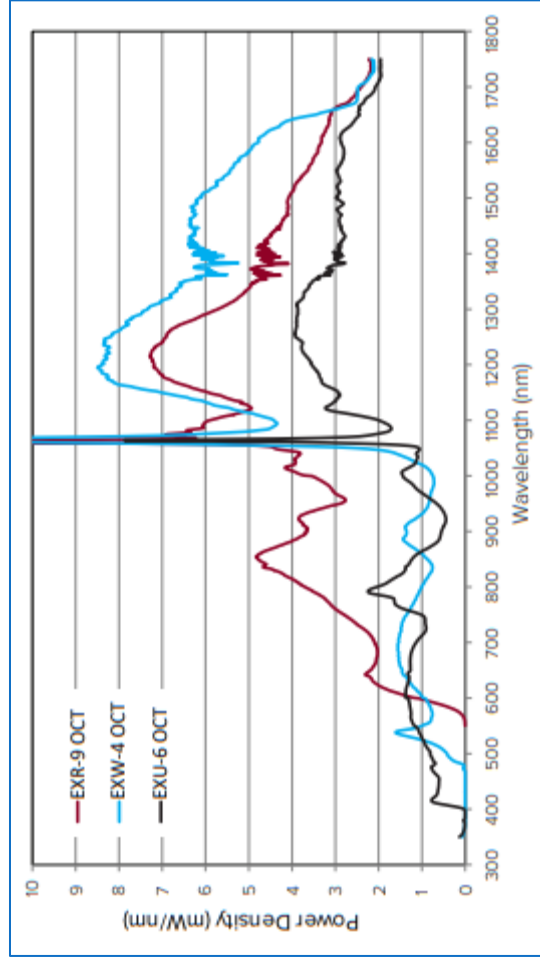
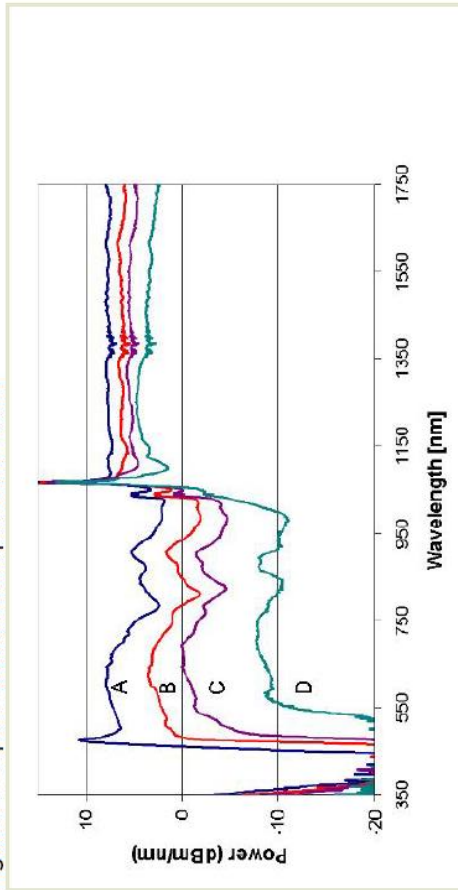
[1.0] An infrared light source, comprising:

Infrared light is generally understood to include wavelengths from around 750 nanometers (nm) to around 10,000 nm or more. The Accused Lasers generate infrared light in this range as shown in the exemplary charts below:¹



¹ The "SuperK FIANIUM typical output spectrum" chart is from page 5 of NKT's "SuperK FIANIUM Datasheet." The "Figure 2 Supercontinuum output of the laser" chart is from p. 23 of NKT's "SuperK EXTREME Product Guide." Both are available at <https://www.nktphotonics.com/product-manuals-and-documentation/>. The SuperK FIANIUM OCT chart is from [SuperK FIANIUM OCT - NKT Photonics](#). The EXR-9/4/6 OCT chart is from [nkt_supercontinuum_extreme_oct_opt.pdf \(optoprim.it\)](#).

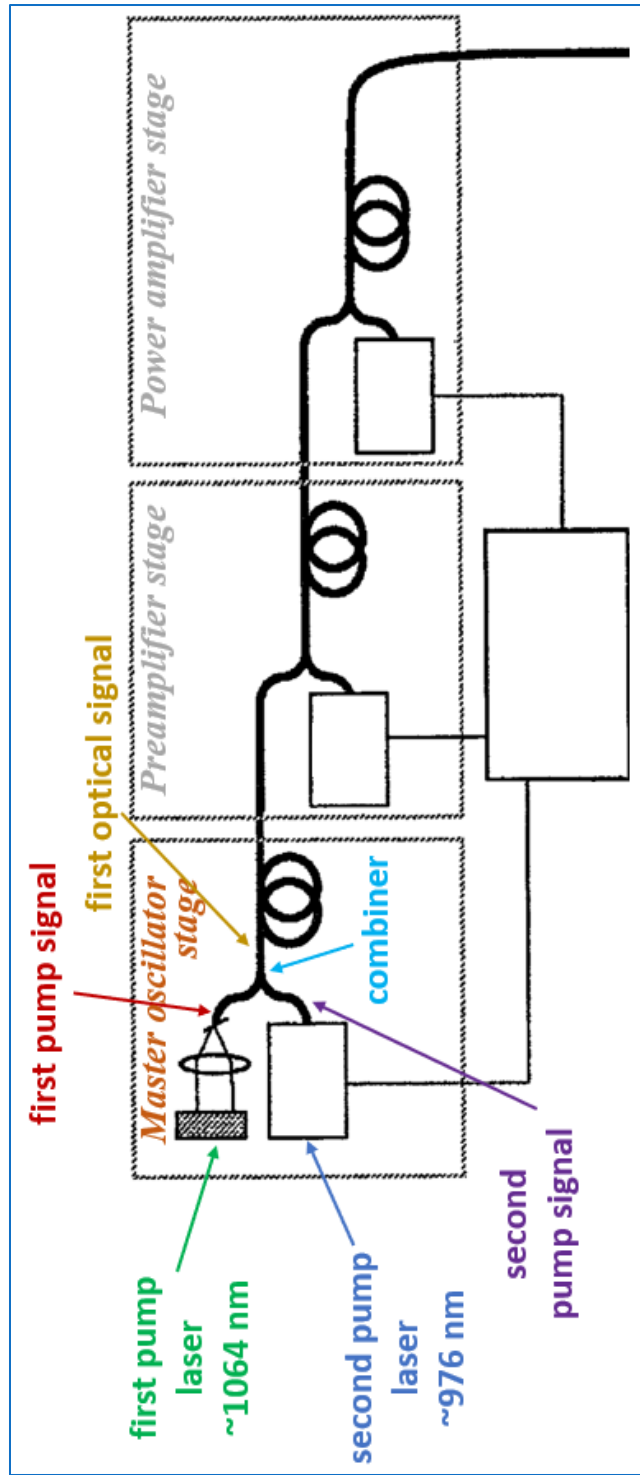
Figure 2 Supercontinuum output of the laser



[1.1] one or more combiners coupled to at least a first pump laser operable to generate a first pump signal and a second pump laser operable to generate a second pump signal, the one or more combiners operable to combine the first pump signal and the second pump signal into a first optical signal,

The annotated drawing below schematically illustrates relevant parts of the Accused Lasers:²

² The block diagram is based on Fig.2 of U.S. Pat. No. 8,913,317 B2, which names Carsten L. Thomsen, CEngO of NKT Photonics A/S, as one of the inventors.



As shown, the Accused Lasers have a first pump laser that generates a first pump signal. The Accused Lasers also have a second pump laser that generates a second pump signal. The two pump lasers are coupled to a combiner that combines the two pump signals into a first optical signal.

[1.2] the first pump signal comprising at least a first wavelength and the second pump signal comprising at least a second wavelength wherein the first wavelength of the first pump signal is substantially different than the second wavelength of the second pump signal; and

As shown in the block diagram in [1.1], the wavelength of the first pump signal in the Accused Lasers is about 1064 nm,³ which is substantially different from the about 976 nm wavelength of the second pump signal.

³ See, e.g., US Pat. No. 9,564,731 B2 assigned to Fianium Ltd., col. 1, ll. 19-29.

[1.3] a wavelength shifter coupled to the one or more combiners,

The Accused Lasers have a wavelength shifter (labeled 12, 13, and 14 in exemplary Fig. 6, below).⁴ The wavelength shifter is coupled to the combiner, which is in block 20 in exemplary Fig. 6, below.

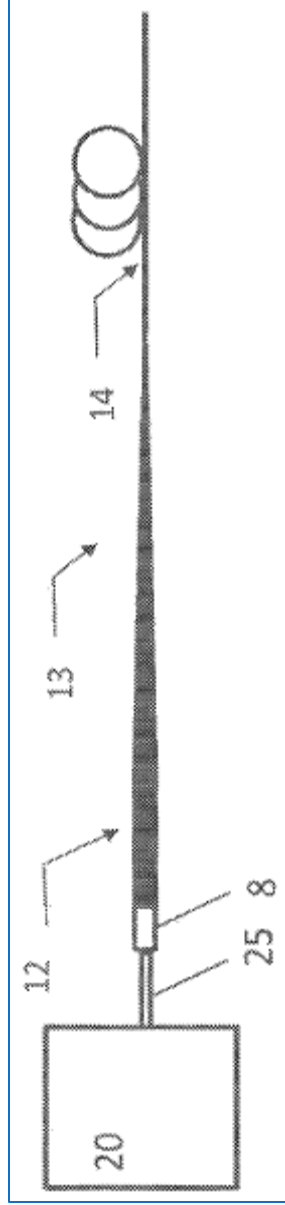


Fig. 6

[1.4] the wavelength shifter comprising a first waveguide structure and a second waveguide structure

The wavelength shifter in the Accused Lasers have a first waveguide structure (labeled 12 in Fig. 6 of limitation [1.3]) and a second waveguide structure (labeled 13 and 14 in Fig. 6 of limitation [1.3]).

[1.5] the wavelength shifter operable to receive the first optical signal

The wavelength shifter in the Accused Lasers receives the first optical signal (labeled 25 in Fig. 6 of limitation [1.3]).

[1.6] and to wavelength shift at least a portion of the first optical signal based at least in part on a Raman effect,

As shown in exemplary Fig. 1, below, the wavelength shifter in the Accused Lasers “blueshifts” and “redshifts” a portion of the first optical signal (green “Pump pulse”). The shifting occurs based on the Raman effect (see, e.g., App Note # 2.0, “Supercontinuum

⁴ Fig. 6 is from U.S. Pat. No. 11,221,445 B2 assigned to defendant NKT Photonics A/S.

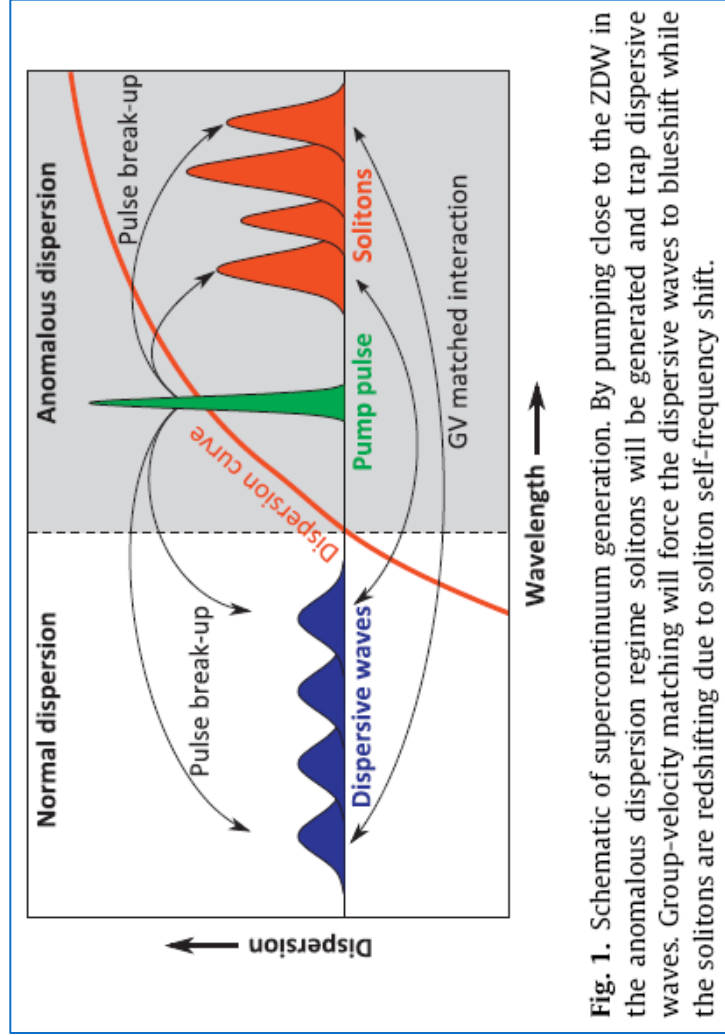


Fig. 1. Schematic of supercontinuum generation. By pumping close to the ZDW in the anomalous dispersion regime solitons will be generated and trap dispersive waves. Group-velocity matching will force the dispersive waves to blueshift while the solitons are redshifting due to soliton self-frequency shift.

[1.7] wherein the wavelength shifter operates to wavelength shift at least the first wavelength to an intermediate optical wavelength in the first waveguide structure

The first waveguide structure in the wavelength shifter of the Accused Lasers (labeled 12 in Fig. 6 of limitation [1.3]) shifts the first wavelength (the wavelength of the green “Pump pulse” in Fig. 1 of limitation [1.6]) to an intermediate optical wavelength (the wavelength of the red “Solitons” in Fig. 1 of limitation [1.6]).

[1.8] and to wavelength shift the intermediate optical wavelength to a longer optical wavelength in the second waveguide structure;

The second waveguide structure in the wavelength shifter of the Accused Lasers (labeled 13 and 14 in Fig. 6 of limitation [1.3]) shifts the intermediate optical wavelength (the red “Solitons” in Fig. 1 of limitation [1.6]) to a longer optical wavelength as shown in the two charts of limitation [1.0].

[1.9] wherein at least a portion of the intermediate optical wavelength is greater than the first wavelength

As shown in Fig. 1 of limitation [1.6], the intermediate optical wavelength in the Accused Lasers (the wavelength of the red “Solitons”) is greater than the “first wavelength” (green “Pump pulse”).

[1.10] and wherein at least a portion of the longer optical wavelength is greater than the intermediate optical wavelength; and

As shown in the charts of limitation [1.0], at least a portion of the “longer optical wavelength” in the Accused Lasers (e.g., the wavelengths at the far right ends of the charts in limitation [1.0]) is greater than the intermediate optical wavelength (the red “Solitons” in Fig. 1 of limitation [1.6]).

[1.11] wherein the first waveguide structure is substantially different than the second waveguide structure.

As illustrated in exemplary Fig. 5, below,⁵ the structure of the first waveguide structure (labeled 12) in the Accused Lasers is substantially different from that of the second waveguide structure (labeled 13 and 14).

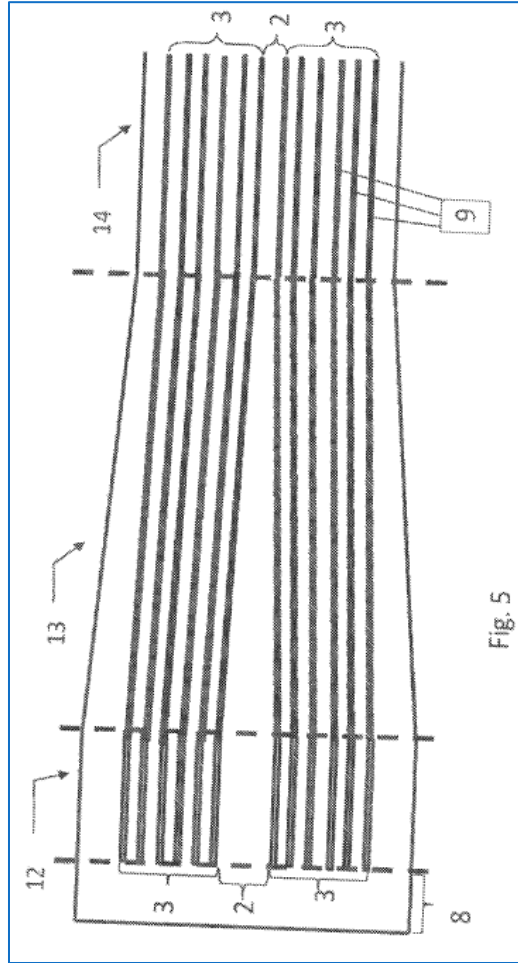


Fig. 5

⁵ Fig. 5 is from U.S. Pat. No. 11,221,445 B2 assigned to defendant NKT Photonics A/S.

CLAIM 2

[2.0] The infrared light source of claim 1, wherein the first pump laser is selected from the group consisting of a continuous wave laser and a pulsed laser.

As shown in the charts below,⁶ the first pump laser in the Accused Lasers are is a pulsed lasers.

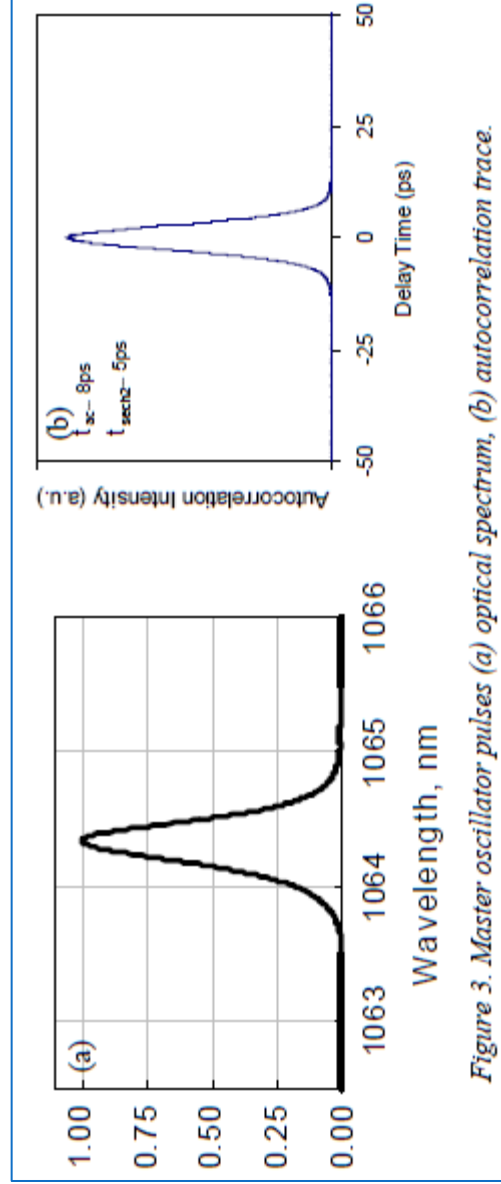


Figure 3. Master oscillator pulses (a) optical spectrum, (b) autocorrelation trace.

CLAIM 3

[3.0] The infrared light source of claim 1, wherein the first pump laser is selected from the group consisting of a solid state laser, a Nd:YAG laser, a Nd:YLF laser, laser diodes, a semiconductor laser, and a cladding pump fiber.

The first pump laser in the Accused Lasers is a solid state laser.

⁶ Figure 3, Almeida, et al., Ultrafast Fiber Lasers and Nonlinear Generation of Light, § 3.2 (IEEE 2009).

CLAIM 4

[4.0] The infrared light source of claim 1, wherein the second pump laser is selected from the group consisting of a solid state laser, a Nd:YAG laser, a Nd:YLF laser, laser diodes, a semiconductor laser, and a cladding pump fiber.

The second pump laser in the Accused Lasers is a laser diode

CLAIM 9

[9.0] The infrared light source of claim 1, wherein the longer optical wavelength comprises a pulsed optical signal having a pulse repetition rate in the range of two (2) hertz to one hundred (100) megahertz.

The pulse repetition rate for the Accused SuperK FIANIUM Lasers is 78 MHz.⁷

CLAIM 12

[12.0] The infrared light source of claim 1, wherein the one or more combiners are selected from the group consisting of a wavelength division multiplexer and a power coupler.

The Accused Lasers use a wavelength division multiplexer to combine the two wavelengths.

CLAIM 13

[13.0] The infrared light source of claim 1, wherein the first waveguide structure is selected from the group consisting of a dispersion compensating fiber, a dispersion shifted fiber, a single mode fiber, a chalcogenide fiber, and a fused silica optical fiber.

In the Accused Lasers, the first waveguide structure is a single mode fiber.

⁷ See, <https://www.nktphotonics.com/products/supercontinuum-white-light-lasers/superk-fianium/> (“Specifications”) and <https://web.archive.org/web/20171220124529/http://www.nktphotonics.com/lasers-fibers/en/product/superk-extreme-supercontinuum-lasers/> (“Specifications”).

CLAIM 14

[14.0] The infrared light source of claim 1, wherein at least a portion of the first waveguide structure is selected from the group consisting of an optical fiber, a hollow tube waveguide, an air core waveguide, and a planar waveguide.

In the Accused Lasers, the first waveguide structure is an optical fiber.

CLAIM 16

[16.0] The infrared light source of claim 1, wherein at least a portion of the second waveguide structure is selected from the group consisting of an optical fiber, a hollow tube waveguide, an air core waveguide, and a planar waveguide.

In the Accused Lasers, the second waveguide structure is an optical fiber.

CLAIM 19

[19.0] The infrared light source of claim 1, wherein the longer optical wavelength comprises a wavelength of approximately 1.7 microns or more.

As shown in the charts for limitation [1.0], the longer optical wavelength comprises a wavelength of approximately 1.7 microns or more.

CLAIM 20

[20.0] The infrared light source of claim 1, wherein the longer optical wavelength comprises a wavelength in the range of two (2) microns to ten (10) microns.

As shown in the charts for limitation [1.0], the longer optical wavelength comprises a wavelength in the range of two (2) microns to ten (10) microns.

CLAIM 22

[22.0] The infrared light source of claim 1, further comprising a wavelength separator coupled to the wavelength shifter and capable of transmitting at least a portion of a selected wavelength from the wavelength shifter.

Defendants make, use, sell, offer for sale, and import additional products for use with the Accused Lasers that comprise a wavelength separator that can be coupled to the wavelength shifter of the Accused Lasers. The wavelength separators are capable of transmitting at least a portion of a selected wavelength from the wavelength shifter. These additional products include the LLTF Tunable High Contrast Filter, the SuperK VARIA tunable single line filter, the SuperK SELECT multi-line tunable filter, and the SuperK SPLIT spectral supercontinuum splitter.

CLAIM 23

[23.0] The infrared light source of claim 22, wherein the wavelength separator is selected from the group consisting of a demultiplexer, one or more partially transmissive gratings, one or more partially transmitting mirrors, one or more Fabry Perot filters and one or more dielectric gratings.

In the Accused Lasers, the wavelength separator is a demultiplexer.

CLAIM 24

[24.0] The infrared light source of claim 1, further comprising at least a third waveguide structure coupled to the wavelength shifter, wherein a coupling loss between the third waveguide structure and the wavelength shifter comprises no more than five (5) decibels.

As shown below, the Accused Lasers include an “armored fiber cable,”⁸ which is a third waveguide structure coupled to the wavelength shifter. The coupling loss between the third waveguide structure and the wavelength shifter comprises no more than five (5) decibels.

⁸ See p. 6 of page 5 of NKTP’s “SuperK FIANIUM Datasheet” and p. 34 of NKTP’s “SuperK EXTREME Product Guide.”

Defendants also make, use, sell, offer for sale, and import an additional product for use with the Accused Lasers that comprises at least a third waveguide structure coupled to the wavelength shifter with the coupling loss between the third waveguide structure and the wavelength shifter being no more than five (5) decibels. This additional product includes the SuperK CONNECT broadband fiber delivery.

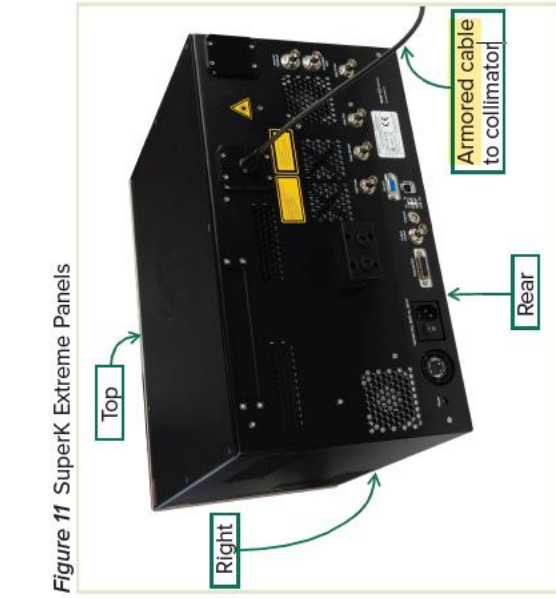


Figure 11 SuperK Extreme Panels

U.S. PATENT NO. 7,519,253

L.R. 16-6(d)(1)(A)(iii) Element-By-Element Description of Where and How Each Element of Each Asserted Claim is Found in Each Accused Product

Omni makes these claim charts with as much specificity as reasonably possible from publicly available information or other information then within its possession, custody, or control. These contentions also rely on Dr. Islam's knowledge and understanding of supercontinuum lasers.

Omni contends that all Accused Lasers meet the limitations below in substantially the same way, so this claim chart applies to all Accused Lasers except as specified otherwise.

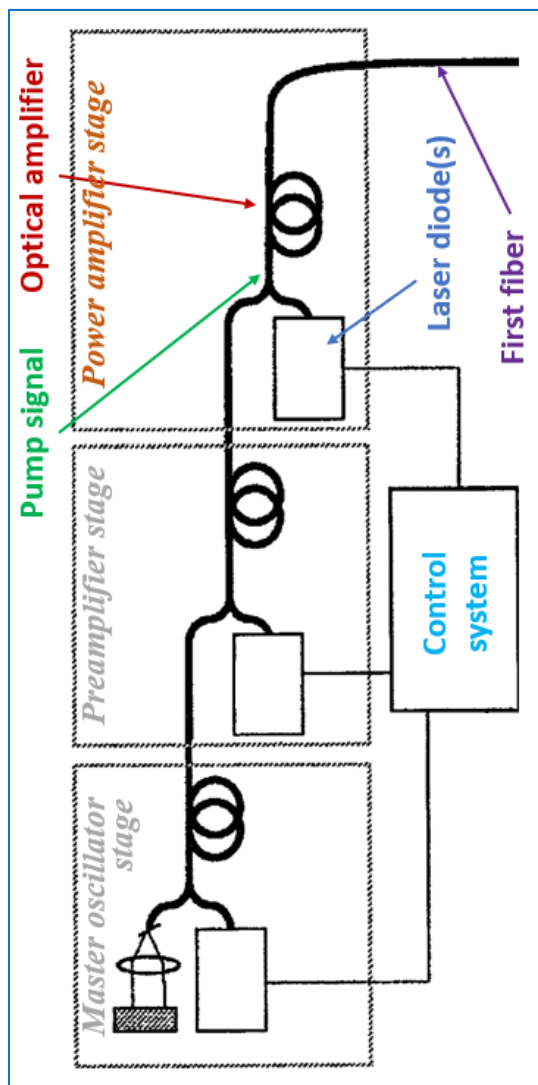
CLAIM 1

[1.0] A broadband light comprising:

The Accused Lasers are broadband light sources because they emit white light.

[1.1] one or more laser diodes capable of generating a pump signal comprising a wavelength shorter than 2.5 microns, a pulse width of at least 100 picoseconds and a pump optical spectral width;

The annotated drawing below schematically illustrates relevant parts of the Accused Lasers:

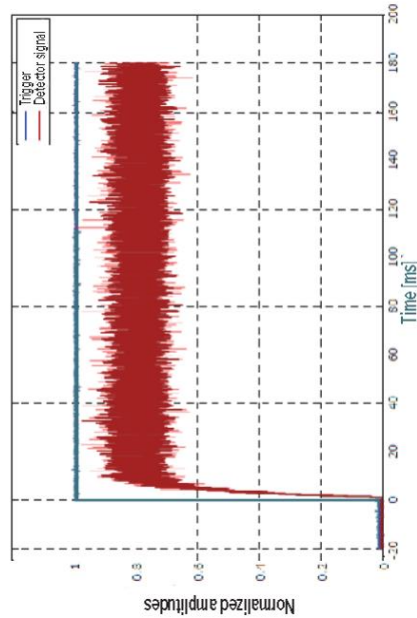
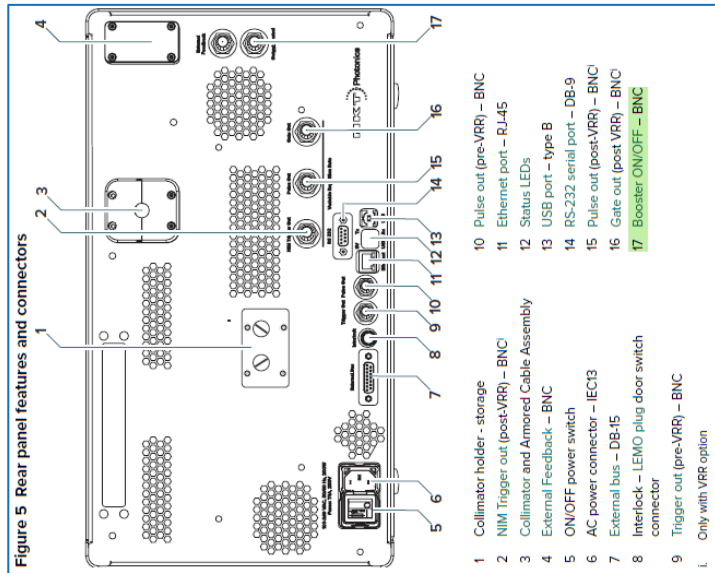


The Accused Lasers have one or more laser diodes (labeled “Laser diode(s)”). In combination with the signals from prior stages of the system, the Laser diode(s) generate a “Pump signal” of about 1064 nm (1.064 microns), which is shorter than 2.5 microns. A “Control system” in the Accused Lasers controls the operation of the Laser diode(s).

In the SuperK FIANIUM series, a “Booster ON/OFF” input (item 17 in Figure 5, below)¹ directs the Control system to control the pulse width of the Pump signal by activating or deactivating the Laser diode(s). Using the Booster ON/OFF input, the SuperK FIANIUM

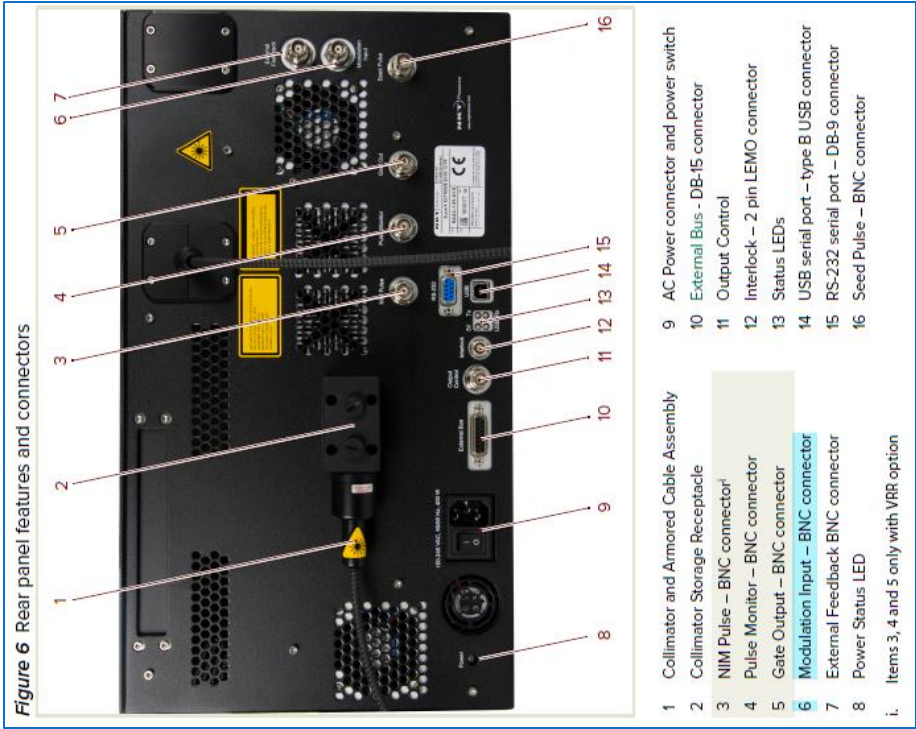
¹ Figure 5 is from the NKT Photonics SuperK FIANIUM Product Guide available at <https://www.nktphotonics.com/product-manuals-and-documentation/>.

series is capable of generating a Pump signal of at least 100 picoseconds as illustrated in Figure 21, below from the NKT Photonics SuperK FIANIUM Product Guide.



In the SuperK EXTREME series, a “Modulation input” (item 6 in Figure 6, below)² directs the Control system to control the pulse width of the Pump signal by activating or deactivating the Laser diode(s). Using the “Modulation input,” the SuperK EXTREME series is capable of generating a Pump signal of at least 100 picoseconds.

² Figure 6 is from the NKT Photonics SuperK EXTREME Product Guide available at <https://www.nktphotonics.com/product-manuals-and-documentation/>.



As shown in Table 1, below, the “Modulation bandwidth” can be 100Hz, which equals a pulse width of 10 microseconds, which is more than 100 picoseconds. As noted above, the “Modulation bandwidth” determines the pulse width of the Pump signal.

Parameter	Value
Modulation input voltage	0 – 10V
Current mode	
Modulation bandwidth, 3dB	100Hz (typ)
Rise- and fall-time	<5ms (typ)
Power mode	
Modulation bandwidth, 3dB	50Hz (typ)
Rise- and fall-time	<10ms (typ)
Feedback input voltage	0 – 4V
Feedback bandwidth	<200Hz
Feedback sample rate	200Hz

Table 1: Modulation and Feedback Interface Specifications

In both laser series, the pump signal necessarily has an optical spectral width.

[1.2] one or more optical amplifiers coupled to the pump signal and capable of amplifying the pump signal to a peak power of at least 500 W;

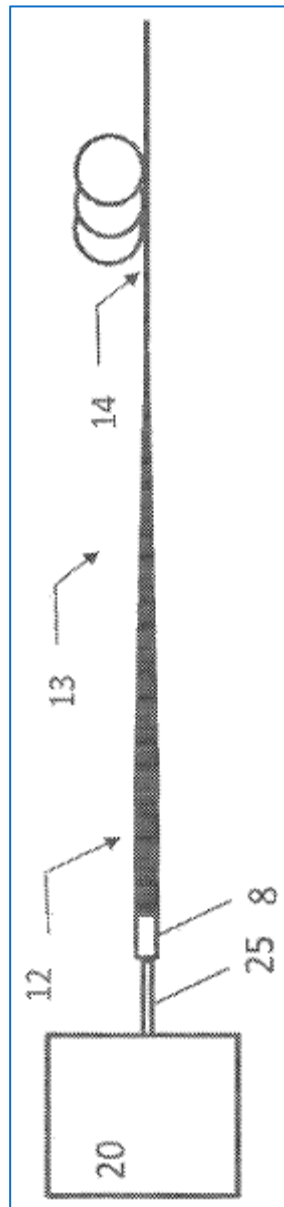
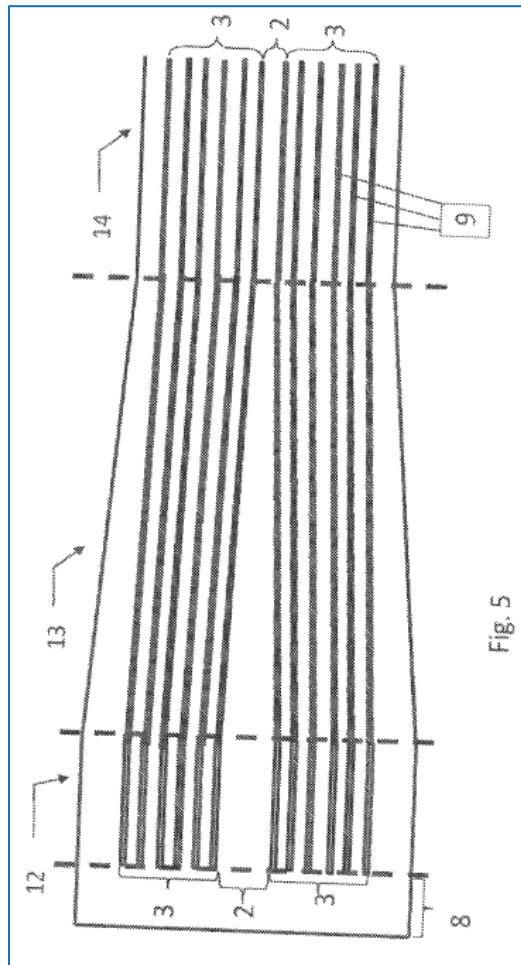
The Accused Lasers have one or more optical amplifiers (labeled “Optical amplifier” in the illustrative schematic drawing of [1.1]). As shown, the optical amplifier is coupled to the Pump signal. As explained in U.S. Pat. No. 9,531,153 B2,³ “[t]he output of the amplifier is a high-energy pulse of up to ... tens of kilowatt peak power,” which is a peak power greater than 500W.

[1.3] a first fiber coupled to the one or more optical amplifiers,

The Accused Lasers have a first fiber, labeled 12 in exemplary Figs. 5 and 6, below,⁴ connected to the optical amplifier (in box 20 of Fig. 6, below).

³ U.S. Pat. No. 9,531,153 B2 was originally assigned to Fianium Ltd. and is now owned by NKT Photonics A/S.

⁴ Fig. 6 is from U.S. Pat. No. 11,221,445 B2 assigned to defendant NKT Photonics A/S.



[1.4] the first fiber comprising an anomalous group-velocity dispersion regime and a modulational instability mechanism that modulates the pump signal,

The Accused Lasers comprise an anomalous group-velocity dispersion regime as shown in exemplary Fig. 1, below, and use “[m]odulation instability (MI) [that] lead[s] to temporal break-up of the high-power pump pulse into a distribution of soliton-like pulses[.]”⁵

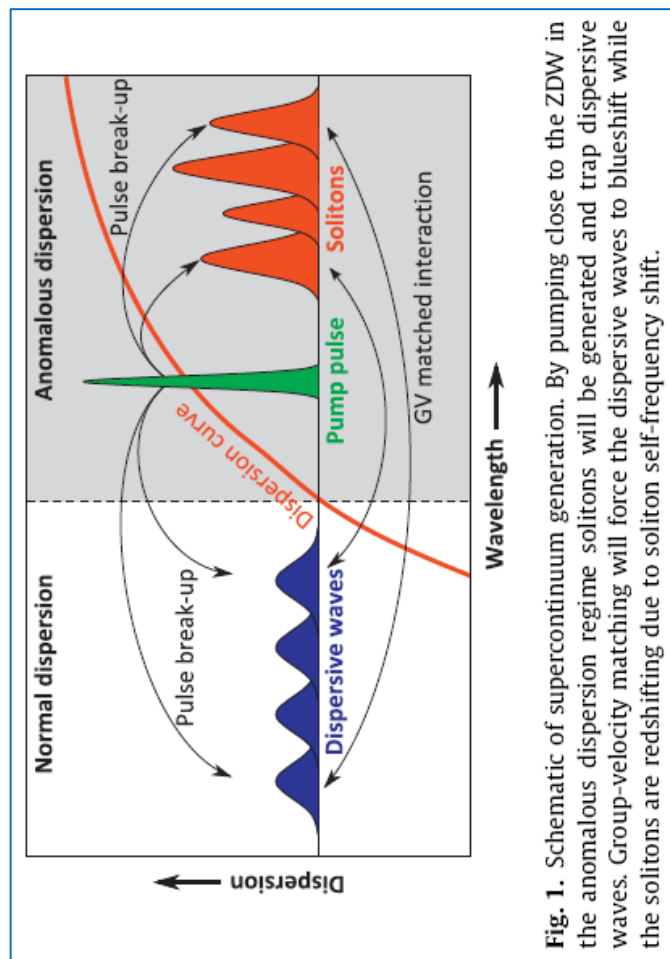


Fig. 1. Schematic of supercontinuum generation. By pumping close to the ZDW in the anomalous dispersion regime solitons will be generated and trap dispersive waves. Group-velocity matching will force the dispersive waves to blueshift while the solitons are redshifting due to soliton self-frequency shift.

⁵ Exemplary Fig. 1 and the quotation are from Møller, Optical Fiber Technology 18 (2012), available at <https://doi.org/10.1016/j.yofte.2012.07.010>. Møller is co-authored by employees of NKT Photonics A/S and, on information and belief, describes relevant aspects of the Accused Lasers based on Dr. Islam’s knowledge of NKT’s accused supercontinuum laser products, including information from persons knowledgeable about the Accused Lasers.

[1.5] wherein the pump signal wavelength resides in the anomalous group-velocity dispersion regime of the first fiber, As shown in [1.4] Fig. 1, above, the pump signal (in green, labeled “Pump pulse”) resides in the anomalous group-velocity dispersion regime (grey-shaded portion labeled “Anomalous dispersion”) of the fiber.

[1.6] and wherein different intensities in the pump signal can cause relative motion between different parts of the modulated pump signal produced through modulational instability in the first fiber; and

As shown in [1.4] Fig. 1, above, the pump signal (green) in the Accused Lasers can cause relative motion (“blueshift” and “redshift”) between different parts of the modulated pump signal (“dispersive waves” and “solitons”) depending on the intensity of the pump signal.

[1.7] a nonlinear element coupled to the first fiber capable of broadening the pump optical spectral width to at least 100 nm through a nonlinear effect in the nonlinear element.

The Accused Lasers have a nonlinear element (e.g., the part of the fiber labeled 13 and 14 in [1.3] Fig. 6, above) coupled to the first fiber (labeled 12 in Fig. 6, above) that is capable of broadening the pump optical spectral width to at least about 100 nm through a nonlinear effect in the nonlinear element as illustrated in the exemplary charts, below.⁶

⁶ The “SuperK FIANIUM typical output spectrum” chart is from page 5 of NKTP’s “SuperK FIANIUM Datasheet.” The “Figure 2 Supercontinuum output of the laser” chart is from p. 23 of NKTP’s “SuperK EXTREME Product Guide.” Both are available at <https://www.nktphotonics.com/product-manuals-and-documentation/>. The SuperK FIANIUM OCT chart is from [SuperK FIANIUM OCT - NKT Photonics](#). The EXR-9/4/6 OCT chart is from [nkt_supercontinuum_extreme_oct_opt.pdf \(optoprim.it\)](#).

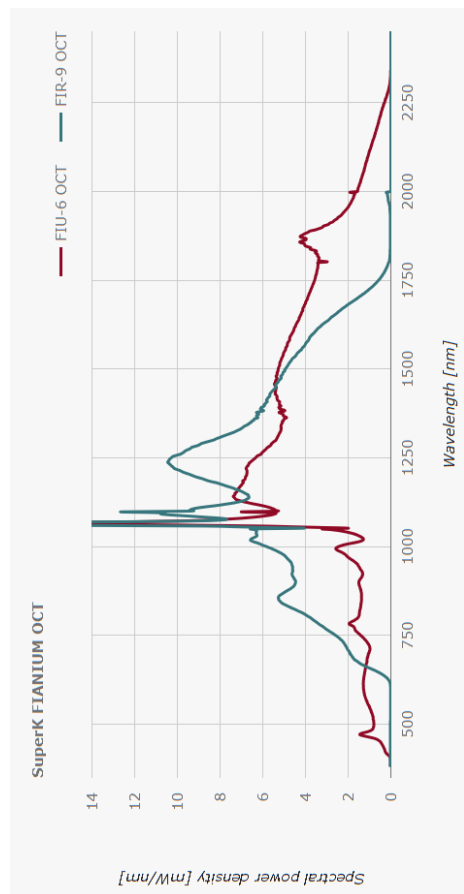
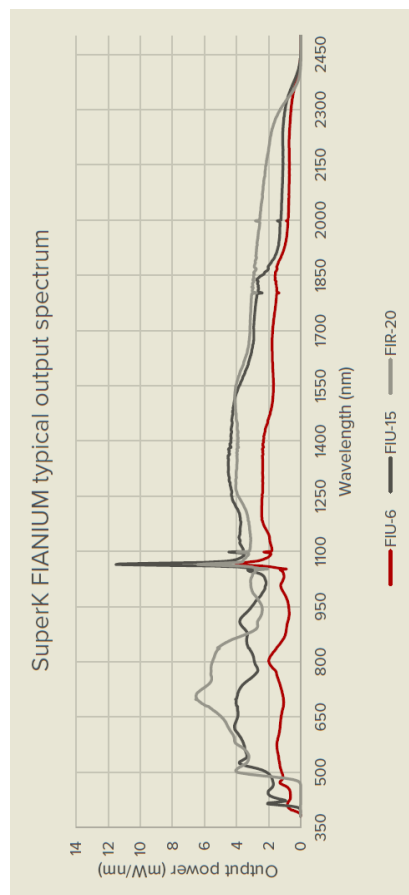
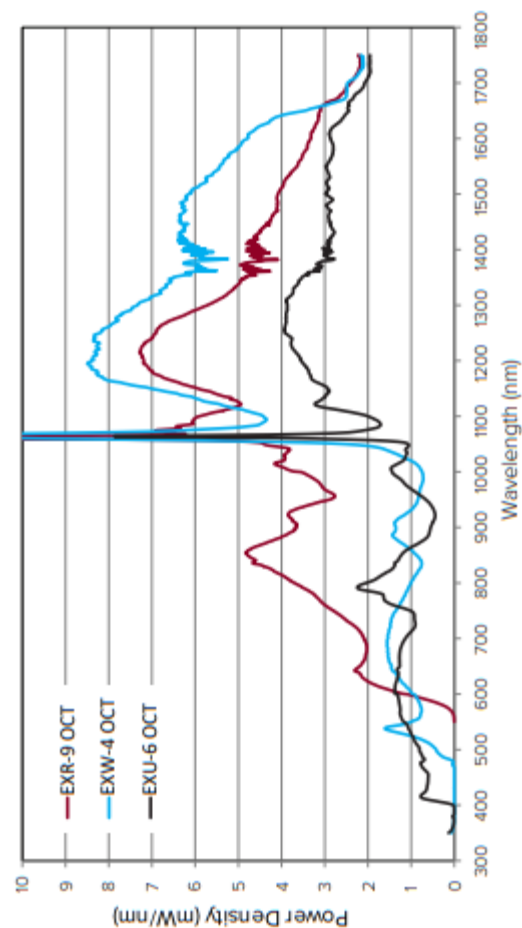
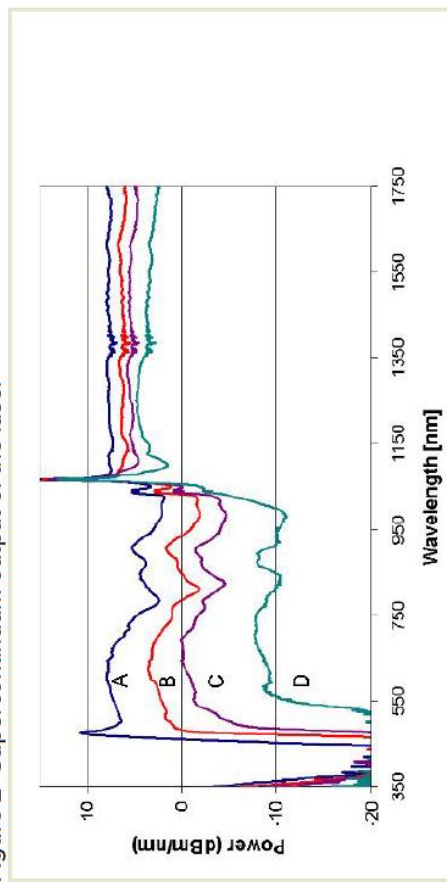


Figure 2 Supercontinuum output of the laser



CLAIM 2

[2.0] The broadband light source of claim 1, wherein the one or more optical amplifiers are selected from the group consisting of a rare-earth doped fiber amplifier, a thulium-doped fiber amplifier, an erbium-doped fiber amplifier, a semiconductor optical amplifier, a Raman amplifier, and a cladding pumped fiber amplifier.

The one or more optical amplifiers in the Accused Lasers are a rare-earth doped fiber amplifier.

CLAIM 3

[3.0] The broadband light source of claim 1, wherein the first fiber is selected from the group consisting of a fused silica fiber, a standard single-mode fiber, a high-nonlinearity fiber, a dispersion-shifted fiber, a non-zero dispersion shifted fiber, a microstructure fiber and a dispersion compensating fiber.

The first fiber in the Accused Lasers is a fused silica fiber.

CLAIM 4

[4.0] The broadband light source of claim 1, wherein the nonlinear element is selected from the group consisting of a high-nonlinearity fiber, a dispersion-compensating fiber, a ZBLAN fiber, a fluoride fiber, a tellurite fiber, a chalcogenide fiber, a semiconductor waveguide, a PIN silicon waveguide, a photonic crystal fiber, and a hollow core fiber filled with a nonlinear liquid or gas.

The nonlinear element in the Accused Lasers is a photonic crystal fiber.

CLAIM 5

[5.0] The broadband light source of claim 1, wherein the nonlinear element comprises a length 15 meters or less.

The nonlinear element in the Accused Lasers is about 10 meters.⁷

CLAIM 6

[6.0] The broadband light source of claim 1, wherein the nonlinear effect of the nonlinear element is selected from the group consisting of self-phase modulation, self-steepening, a Raman effect, four-wave mixing, and cross-phase modulation.

The nonlinear effect of the nonlinear element is a Raman effect.⁸

CLAIM 7

[7.0] The broadband light source of claim 1, further comprising one or more optical filters coupled to the one or more optical amplifiers to control a level of amplified spontaneous emission, wherein the one or more optical filters are selected from the group consisting of spectral filters and temporal filters.

The Accused Lasers have one or more optical filters coupled to the one or more optical amplifiers to control a level of amplified spontaneous emission. The one or more optical filters are spectral filters.

⁷ See, e.g., US Pat. No. 9,531,153 B2, assigned to Fianium Ltd., col. 10, ll. 36-37.

⁸ See, e.g., Almeida, et al., Ultrafast Fiber Lasers and Nonlinear Generation of Light, § 3.2 (IEEE 2009).

CLAIM 8

[8.0] The broadband light source of claim 1, wherein at least a portion of the one or more optical amplifiers comprises a cladding-pumped fiber amplifier pumped by a plurality of multi-mode pump lasers comprising at least a second wavelength, wherein the second wavelength is substantially different than the pump signal wavelength.

The Accused Lasers have a cladding-pumped fiber amplifier pumped by a plurality of multi-mode pump lasers. The plurality of multi-mode pump lasers comprising at least a second wavelength of about 976 nm, which is substantially different than the pump signal wavelength of about 1064 nm.