Datasheet: Necsel Randomized Nanostructure Fiber Homogenizer
Square 400um core

The randomized Nanostructure Fiber Homogenizer is based on a patented, unique randomized process which creates nanostructures on the fiber surface with anti-reflective properties. Fiber optic cables produced using this process have superior wavelength range, durability and damage thresholds when compared with commonly used coated thin-film surfaces. The Randomized Nanostructure Fiber Homogenizer offers additional benefits for high power applications where input power intensities can degrade coated surfaces. Since the anti-reflective structure is composed of the same underlying material, damage thresholds are typically close to those of a bare fiber. The process also allows for a high-quality anti-reflection surface with a much wider wavelength performance range (up to 2x wider) than conventional AR coated fibers.

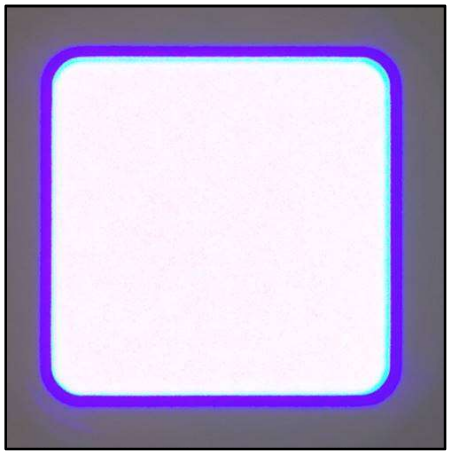
Features	Product Benefits
Randomized Nanostructure coatings	● Optically more efficient than conventional coatings: R<1% ● Higher performance broadband coating with ~2x wider wavelength range ● High damage threshold >200kW/cm2 ● Broad angle of incidence: 0-60°
400um square fiber	● Fiber Homogenizer provides superior wavelength and mode mixing* ● Superior output quality, resulting in a more uniform top-hat output* ● Fewer parts, lower cost and higher reliability*
SS armored jacket	● Provides liquid tight, robust protection from damage

*as compared to conventional hex rod homogenization techniques

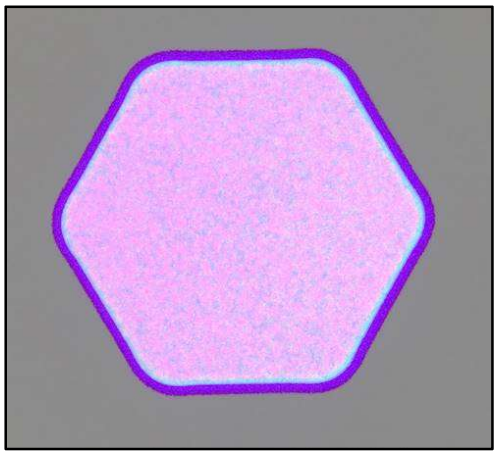
Typical Applications	Standard Specifications
Digital projection	● Anti-reflection type: Randomized Nanostructure
Medical laser	● Available wavelength range: 400nm-800nm
Aerospace	● Fiber size: 400um, 0.20NA ±0.02NA
Bio-analytical instrumentation	● Length: 3M ±75mm
Laser marking/engraving	● Termination: SMA-905, stainless steel
Laser welding/cutting	● Jacket: stainless steel interlocking monocoil
Directed energy	● Reflectance: <1%; angle of incidence: 0-60°
Construction/demolition	● Laser damage threshold (CW): >200kW/cm2 (preliminary, TBD)
High energy spectroscopy	● Cleaning: high pressure gas or CO_2 snow; no solvents or polishing

Photos

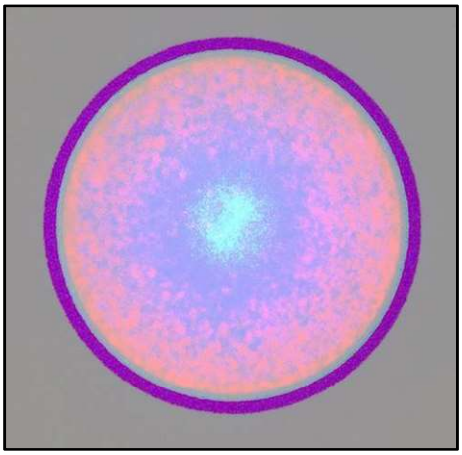
The following three photos are using a Necsel NovaLum 250 RGB laser source to compare the performance of the Randomized Nanostructure Fiber Homogenizer:



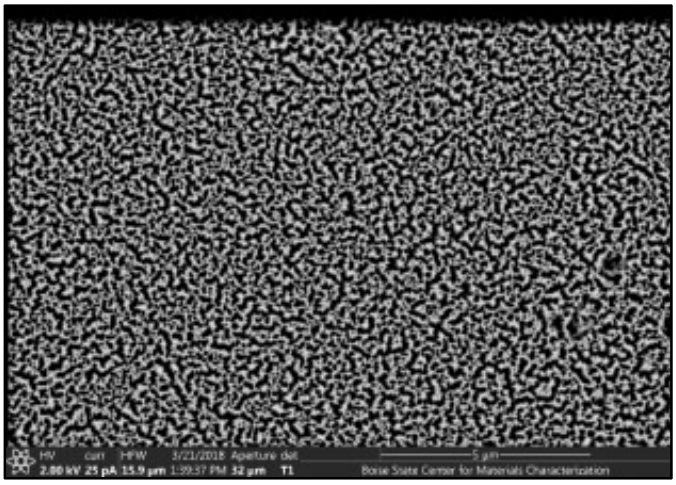
400um, 3m Randomized Nanostructure Fiber Homogenizer with collimator lens



400um, 3m AR coated fiber with 50mm hex homogenizer and collimator lens



400um, 3m AR coated fiber with collimator lens



This is a scanning electron micrograph of the fiber nanostructure. These nanostructures are too small to be seen with typical light-based techniques and provide a gradient in which light becomes trapped, resulting in anti-reflective properties. The photonic damage thresholds of this surface are much greater than that of conventional AR coatings. While optically durable, the structures can be damaged or destroyed by many of the mechanical methods used to clean conventional AR coatings. Since these structures are quite small, they can be crushed or damaged by physical contact, resulting in a loss of anti-reflection. Mechanical cleaning methods may also result in the embedding of foreign materials into the surface, which then become damage centers on the coating.