

# High-Frequency Traders Push Closer to Light Speed With Cutting-Edge Cables



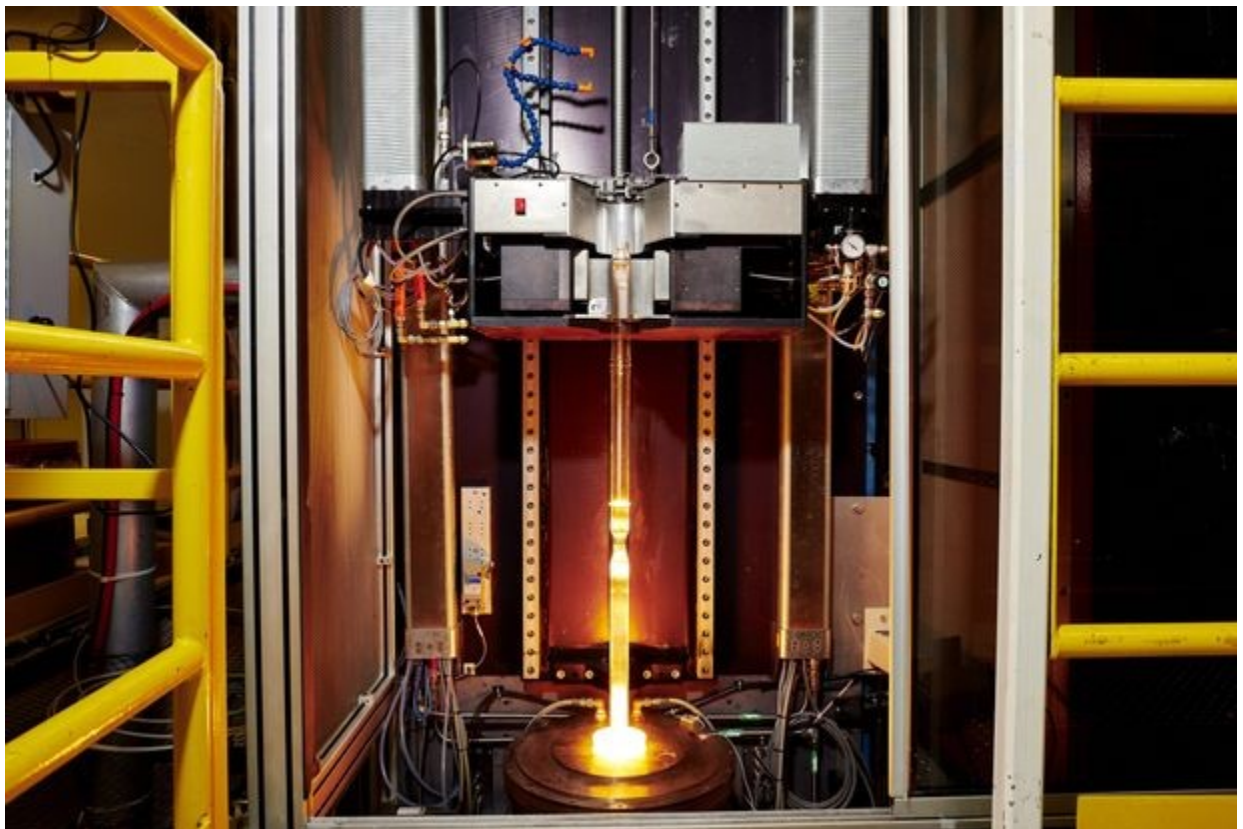
Alexander Osipovich | Photography by Gabby Jones for The Wall Street Journal

High-frequency traders are using an **experimental type of cable** to speed up their systems by **billionths of a second**, the latest move in a technological arms race to execute stock trades as quickly as possible.

The cable, called hollow-core fiber, is a next-generation version of the fiber-optic cable used to **deliver broadband internet** to homes and businesses. Made of glass, such cables carry data encoded as beams of light. But instead of being solid, hollow-core fiber is empty inside, with dozens of parallel, air-filled channels narrower than a human hair.

Because light travels nearly **50% faster through air than glass**, it takes about one-third less time to send data through hollow-core fiber than through the same length of standard fiber.

The difference is often just a minuscule fraction of a second. But in **high-frequency trading**, that can make the difference between profits and losses. HFT firms use sophisticated algorithms and ultrafast data networks to execute rapid-fire trades in stocks, options and futures. Many are secretive about their trading strategies and technology.



**A furnace heats an assembly to form hollow-core fiber at OFS, a manufacturer that has received inquiries from HFT firms during the past year.**

Hollow-core fiber is the latest in a series of advances that fast traders have used to try to outrace their competition. A decade ago, a company called Spread Networks spent about \$300 million to lay fiber-optic cable in a straight line from Chicago to New York, so traders could send data back and forth along the route in just 13 milliseconds, or thousandths of a second. Within a few years the link was superseded by **microwave networks** that reduced transmission times along the route to less than nine milliseconds.

HFT firms have also used [lasers](#) to zip data between the data centers of the New York Stock Exchange and [Nasdaq](#) Inc., and they have embedded their algorithms in superfast computer chips. Now, faced with the limits of physics and technology, traders are left fighting over **nanoseconds**.


“The time increments of these improvements have gotten markedly smaller,” said Michael Persico, chief executive of Anova Financial Networks, a technology provider that runs communications networks used by HFT firms.

High-frequency trading is controversial, with critics [saying that some ultrafast strategies amount to an invisible tax on investors](#). Industry representatives say such [criticism is unfounded](#).



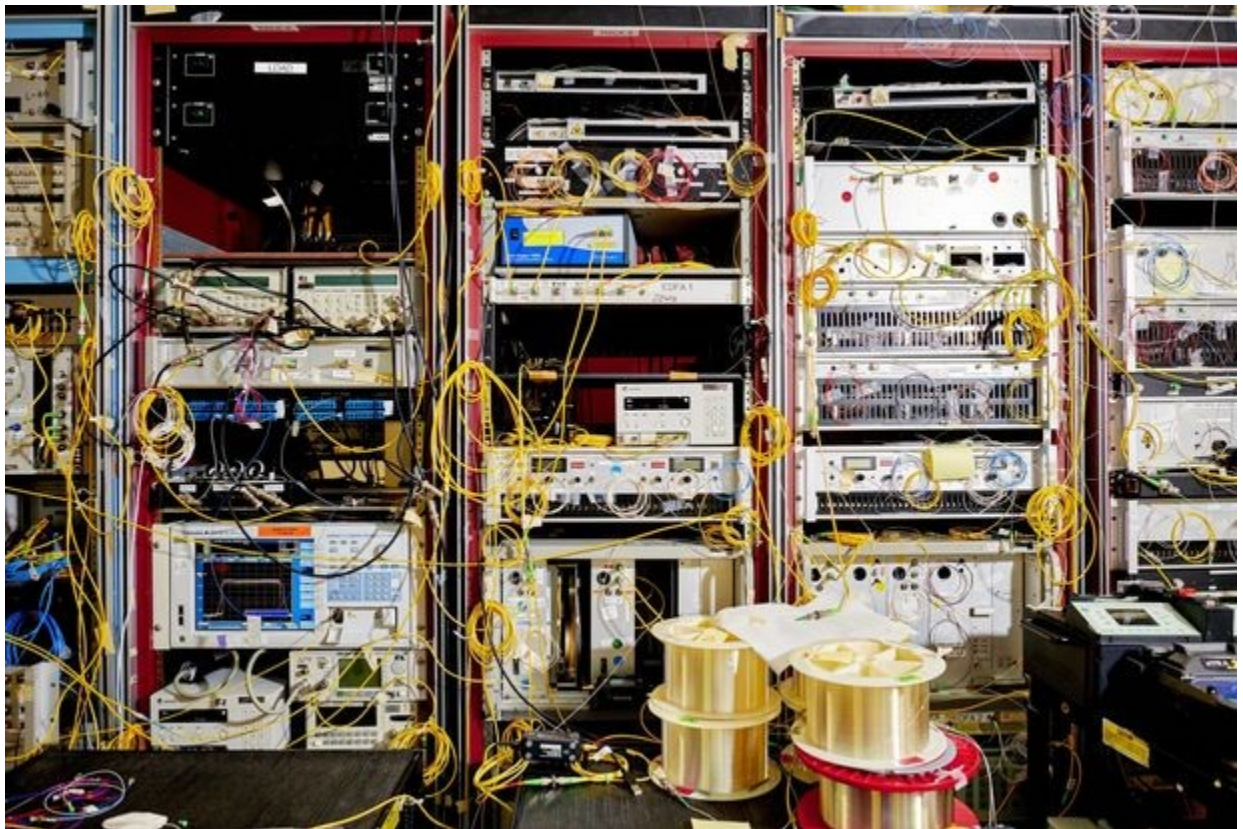
**The assembly before it is heated. Its complex internal structure must be preserved as it is stretched out for the resulting fiber to perform its function.**

Chicago-based DRW Holdings LLC and Jump Trading LLC are among the trading firms that have used hollow-core fiber, people familiar with the matter said. Jump's venture-capital arm has invested in Lumenisity Ltd., a U.K. startup that makes such fiber, one of the people said.


High-frequency traders use hollow-core fiber for **short distances** of several hundred yards at most, according to industry engineers and executives. One common use, they say, is to connect the data center housing an exchange's systems to a nearby communications tower. From there, HFT firms transmit data onward through cross-country networks of **microwave antennas**. 

Replacing standard fiber with hollow-core fiber over that brief stretch might speed up a firm's network by a few hundred nanoseconds. A nanosecond is a billionth of a second.

Anova started using hollow-core fiber about two years ago after a few trading firms deployed it, Mr. Persico said. Two other firms that provide communications services for high-speed traders, McKay Brothers LLC and BSO Network Solutions Ltd., also said they use hollow-core fiber in their networks.



**Fiber-testing equipment at OFS's lab in New Jersey.**

Hollow-core fiber was pioneered in the 1990s but never gained widespread use because of a key problem: Signals sent through such fiber **fade faster** than over standard fiber, making it impractical to use hollow-core fiber for long distances. It is also **costly to manufacture** because of its intricate structure. 

In recent years, though, the cost has come down and some manufacturers have succeeded in creating hollow-core fiber that can transmit data over longer



distances. That has spurred interest from traders.

One manufacturer, OFS, has received more than a dozen inquiries about hollow-core fiber from HFT firms or providers of high-speed trading networks during the past year, said Daryl Inniss, director of new business development at OFS. Hollow-core fiber made by OFS—a U.S.-based unit of Japan's [Furukawa Electric Co. 5801 -1.66%](#) Ltd.—is already being used by several firms active in HFT or trading technology, he added.



**OFS's hollow-core fiber is sheathed in protective coating, then spooled for shipment.**

Lumenisity, the startup backed by Jump, is betting that hollow-core fiber will find uses beyond trading, for instance in telecommunications and [5G networks](#). “We see HFT as an early adopter for the use of hollow-core,” Lumenisity Executive Chairman David Parker said in an interview. He declined to comment on his firm’s relationship with Jump.

The jury is out on whether hollow-core fiber will make deeper inroads into HFT. Industry skeptics say that even if manufacturers create fiber that can send data for tens or hundreds of miles, it is unlikely to replace wireless networks that transmit over straight lines through the air since underground cables inevitably have bends that slow transmission.



Supporters say hollow-core fiber could be used for high-bandwidth links in places like northern New Jersey where the NYSE and Nasdaq have their data centers, or even under the Atlantic, connecting London and New York, if the technology gets good enough.

“When you’re sending light into a solid fiber, it’s like you’re sending it through a window 50 miles thick,” said Dave Gustafson, a former head of wireless engineering at Jump. “With hollow-core, you’re sending it through 50 miles of air.”

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*Does high-frequency trading serve a useful purpose? Join the conversation below.*

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