

60 Years of Fiber Transmission

In January 1966, during a talk at the Institution of Electrical Engineers in London, UK, Charles K. Kao of Standard Telecommunications Labs (STL) in Harlow, UK, reported that removing impurities from glass could create low-loss fiber, making long-distance communication possible. Here we look at fiber optic transmission milestones over the past 60 years. For a look at new innovations in hollow-core fiber, see this month's cover story (p. 26).



Charles K. Kao measuring the transparency of fused silica at STL in Harlow, UK. [Nortel and BNR Europe / Courtesy of J. Hecht]

1966 Charles K. Kao and George A. Hockham of STL, Harlow, UK, promote the possibility that attenuation in optical fibers can be reduced below 20 dB/km.

1970 Robert D. Maurer, Donald Keck, Peter C. Schultz and Frank Zimar of Corning Glass Works, USA, demonstrate a fiber with 17 dB/km attenuation, followed two years later by 4 dB/km.

1977 AT&T installs the first optical telephone communication system under downtown Chicago, USA; each fiber carries the equivalent of 672 voice channels.

1986–87 David N. Payne at the University of Southampton, UK, and Emmanuel Desurvire at Bell Labs, USA, develop the erbium-doped fiber amplifier, which lowers the cost of long-distance fiber systems by reducing or eliminating optical-electrical-optical repeaters.



TAT-8, the first transatlantic fiber optic cable. [Courtesy of AT&T]

1988: AT&T, France Télécom and British Telecom lay the first optical subsea cable; the TAT-8 carries 40,000 calls under the Atlantic.

1991 The development of photonic-crystal fibers, which guide light by diffraction from a periodic structure rather than by total internal reflection and can have hollow cores.

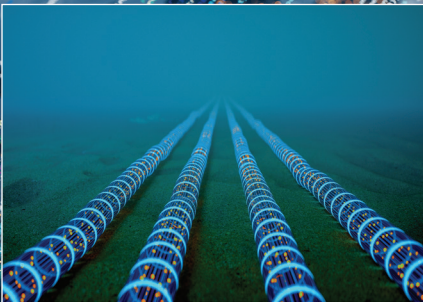
1990s The innovation of wavelength-division multiplexing, which transmits multiple signals over a single fiber by using different wavelengths, exponentially increasing network capacity.

1996 The first submarine cable using optical amplifiers is put into service. The amplifiers are built into the fiber itself and can carry 100× more information than cable using electronic amplifiers.

2000 The first photonic-crystal fibers become commercially available.

2000s Fiber optics becomes the backbone of the global internet infrastructure, enabling broadband speeds of 1 Gbps and beyond.

2014–present The development of hollow-core fibers, which transmit light through air instead of glass, promising even lower latency.



Fiber optic cables across the ocean floor. [imaginima / Getty Images]

2026 >99% of the world's intercontinental traffic is transmitted over fiber optic cables, and researchers at Bell Labs have reached a record bandwidth–distance of >100 Pbps × km.