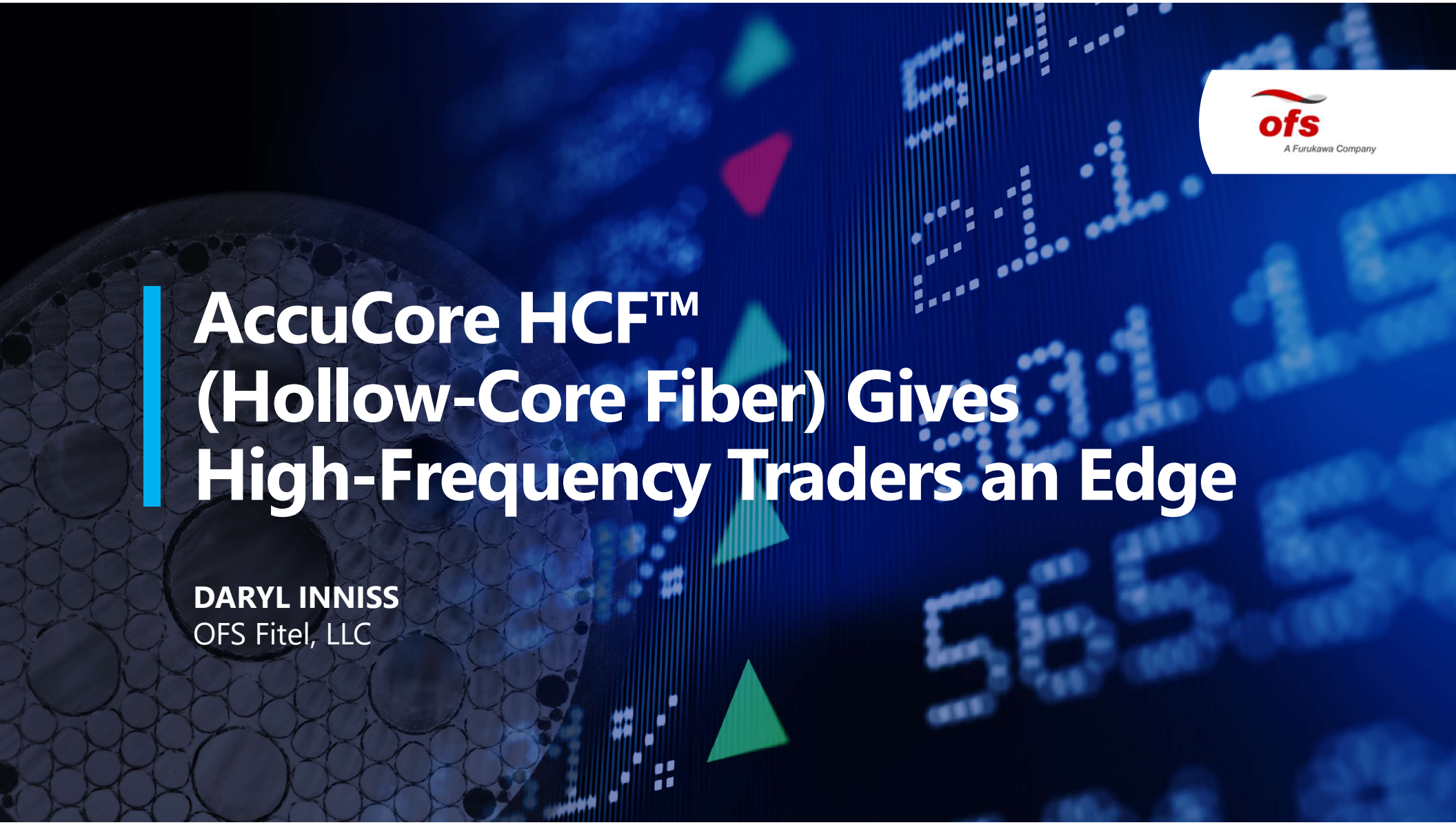


AccuCore HCF™ (Hollow-Core Fiber) Gives High-Frequency Traders an Edge

DARYL INNISS
OFS Fitel, LLC

Hollow-core fiber can trim time by replacing glass-core fiber

Shaving Microseconds can Mean Substantive Advantages and Monetary Gains

OUTSIDE DATA CENTERS

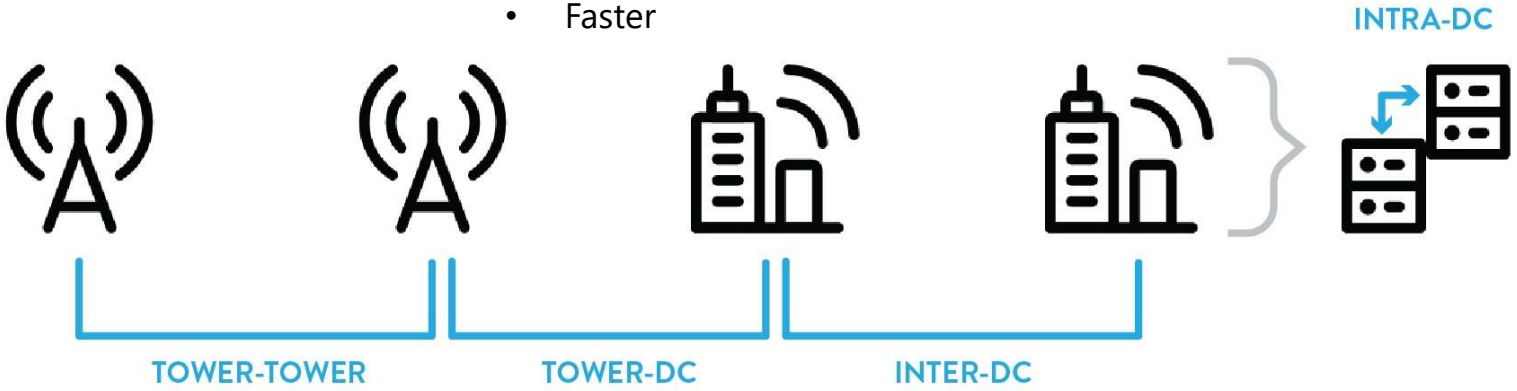
Use microwave radio links

Compared to optical fiber:

- Shorter distances
- Faster

INSIDE DATA CENTERS

- Specialist hardware (i.e. FPGAs)
- Algorithms in assembly language code



But Tower to DC and Intra-DC use glass-core fiber

Acronyms: DC = data center, FPGA = field-programmable gate array

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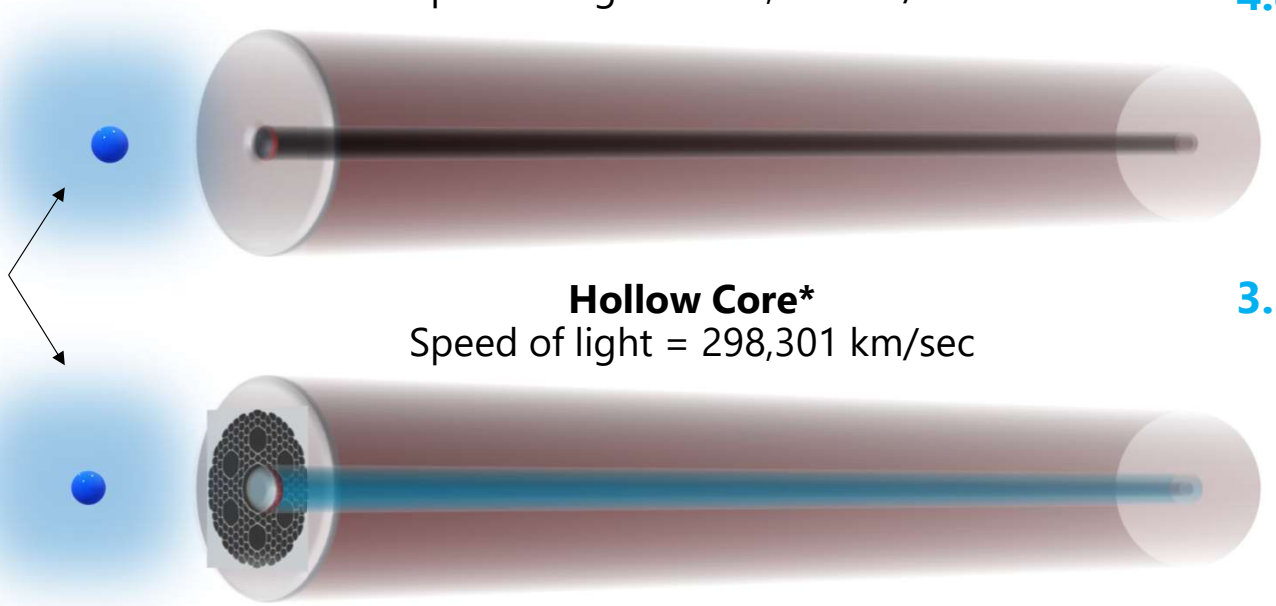
Light Travels Faster in Hollow-Core Fiber than in a Conventional Glass Fiber

1.5 Microseconds per Kilometer (km) Latency Improvement

Glass Core
Speed of light = 204,190 km/sec

Time to travel 1 km
4.897 microseconds

Photons of Light



Hollow Core*
Speed of light = 298,301 km/sec

3.352 microseconds

*Hollow core—transmit light in air core

The Challenge: to realize the latency improvement in field deployed networks because the fiber (i.e., hollow core) is intrinsically sensitive to external stress.

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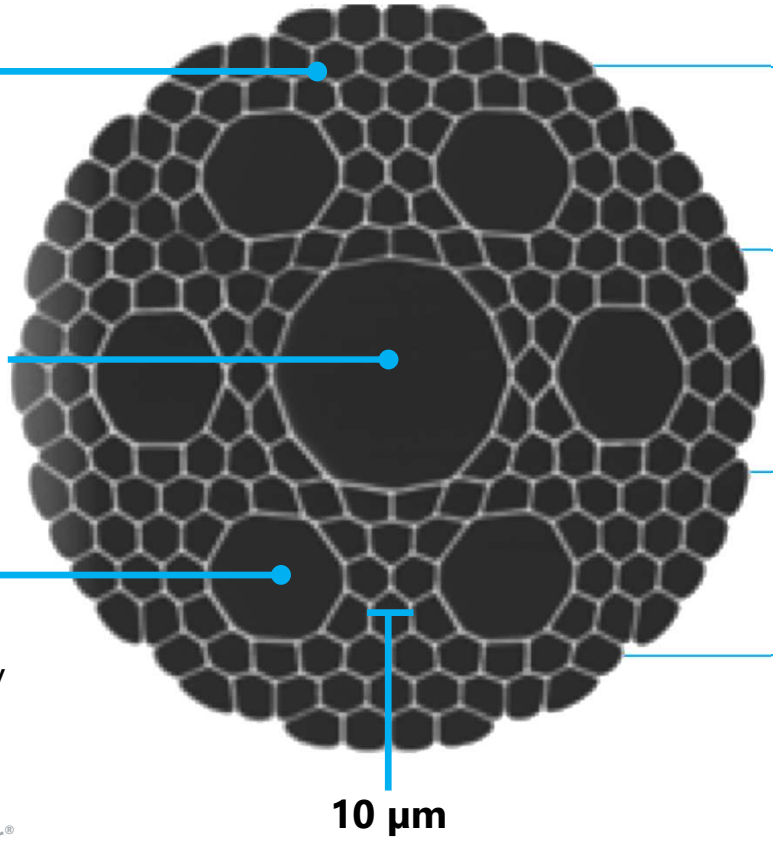
AccuCore HCF (Hollow-Core Fiber) Cables Operational Today in Real Networks

The Low-Latency Transmission is Driven by OFS' Patented Technology and Know-How

Period Air/Silica Cladding
Photonic Bandgap Fiber: For Low-Loss Propagation at Desired Wavelength

Hollow (air) Core

Shunt
OFS technology to improve signal purity



Cable
Indoor/Outdoor

Termination
Factory and Field

Installation
OFS Service

Component Selection
Passive and Active

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Generation 1 AccuCore Provides Numerous Benefits

It's a Cable Assembly with Transmission Wavelength Range of 1550 ± 5 nm
Supporting Lengths up to 2 km

FEATURE	BENEFIT
• Hollow-core fiber	• >30% Latency Improvement*
• 4-fibers per Cable	• 2 HCF + 2 SMF or 4 HCF
• Standard SMF Connectors	• Ease of Use
• WDM Transmission	• High Capacity
• Plenum Rated Cable Material	• For Indoor/Outdoor Use

Acronyms: WDM is wavelength division multiplexing; HCF is hollow core fiber; SMF is single mode fiber (i.e., glass core); nm is nanometer; km is kilometer

*Not STAC Benchmarks

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Generation 2 Under Development: HCF for Transmission Greater than 2km

Reported at Global STAC Live, Spring 2020

- Field deployable HCF cable
- Successful transmission of 33 wavelengths
  - Distance at 3.1 km
  - Data rate at 10 Gbps per wavelength
  - Signals are intensity modulated and direct detected
- Minimum impact of cabling on loss

Global STAC Live, Fall 2020

- Experimental measurements on spool
- Successful transmission of 10 wavelengths
  - Distance at 31.1 km
  - Data rate at 10 Gbps per wavelength
  - also, demonstrated data rate at 200 Gbps
- Used *conventional erbium amplifier

Demonstrates fiber suitable for transmission
Overcome sum of impairments—multi-path interference, chromatic dispersion, and polarization mode dispersion

*Research has demonstrated low-latency Er amplifiers

*Not STAC Benchmarks

Acronyms: HCF is hollow core fiber; Gbps is gigabits per second; km is kilometer

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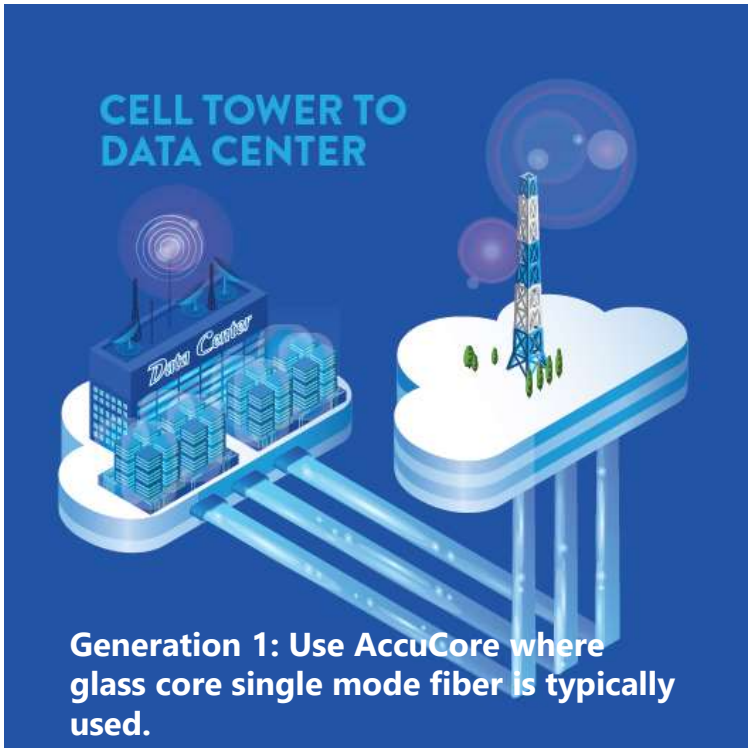
AccuCore trims transmission time



Generation 1: Use AccuCore where glass core single mode fiber is typically used.

*Not STAC Benchmarks

Key Accomplishments

- ✓*Delivers >30% latency improvement
- ✓Installed in multiple indoor/outdoor networks
  - Performance validated by several customers
- ✓OFS offers full (i.e., one-stop-shop) low-latency optical fiber transmission service

Generation 2 Under Development
1310 nm transmission window
Longer lengths and Amplified systems

OFS is happy to discuss user needs

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Thank You

Any Questions?

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