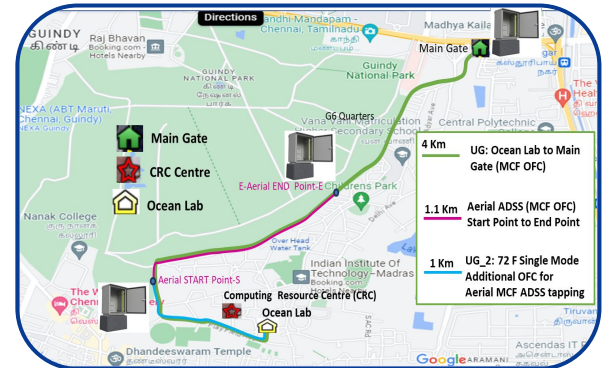




Installation of 4C-MCF in Underground & Aerial Application DoT- Funded AOC-IITM Test-bed

Introduction

In a world where data is growing at breakneck speed—from 4K streaming and AR/VR to 5G and billions of IoT devices our digital infrastructure is facing a moment of reckoning. Traditional single-core optical fibers, once the backbone of connectivity, are now straining under the pressure of hyperscale demand. Recognizing this shift, STL, a global optical solutions innovator, developed a four-core Multicore Fiber (MCF), a next-gen fiber that packs multiple data highways into a single fiber, offering dramatically higher capacity without demanding more physical space.



With support from the Department of Telecommunications (DoT), IIT-Madras transformed its campus into a real-world testbed under its Advanced Optical Communication (AOC) initiative. STL's MCF cables were deployed across underground and aerial routes within the campus, making IIT-M the first academic institution in India to integrate MCF into a legacy optical environment at this scale. This wasn't a simulation. It was a full-scale proof of what's possible when cutting-edge fiber technology meets real-world complexity. The deployment tested everything—from network performance and backward compatibility to durability and design adaptability. And the results were groundbreaking. Over distances up to 50 km, data was transmitted at speeds ranging from 200G to a staggering 80 Tb/s, validating MCF's potential for high-capacity data centers, metro networks, and beyond. What sets this project apart isn't just the technology—it's the collaboration. It's the coming together of academic excellence, industrial expertise, and government vision to build future-ready solutions for real-world challenges. At IIT-Madras, this deployment marks more than a milestone in optical engineering. It's a glimpse into the future of connectivity, scalable, efficient, and built for the digital age. Because when pioneers work together, progress isn't just imagined. It's implemented.

STL's Vision

Acceleration of MCF Adoption

Test-bed helps Multicore fiber market adoption acceleration within India and globally

Standardization of MCF Solution & Benchmarking

Standardizing MCF solutions and benchmarking is crucial across fiber, cables, components, and network architectures

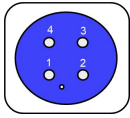
Acceleration of MCF Adoption

Performance evaluation & Optimization, Next Gen MCF solution design & specifications

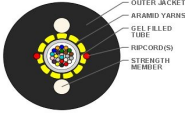
New Use Case Application

Sensing: Temperature, acoustic, strain
Defense

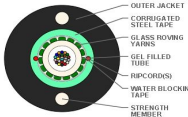
STL Technology Product Solution



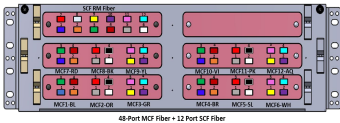
- Non-trench four core multi-core fiber
- Cross-talk @ Neighboring core: -23 dB@ 50 km
- Error free 80 Tb/s validated over 50 km MCF



- Uni-tube 24F hybrid (12 MCF + 12 SCF) ADSS aerial cable
- Compliance with TEC-ER:70022401 Annexure-Tx-A3-OFC



- Uni-tube 24F hybrid (12 MCF + 12 SCF) Armored UG cable
- Compliance with TEC-ER: 70022401 Annexure-Tx-A1-OFC



- MCF Fan-out integrated connectivity solution for MCF connectivity to legacy SCF network
- Supports field-deployable, scalable infrastructure and MCF commercial deployments of high-capacity MCF-based systems.

Implementation/Deployment Journey

STL, in collaboration with IIT Madras, successfully deployed India's first hybrid MCF-SCF cable, marking a major milestone in next-generation optical infrastructure. The cable was custom-developed, rigorously tested for mechanical and optical performance, and verified for deployment under real-world campus conditions.

- A hybrid 24F cable (12MCF + 12 SCF) was designed for deployment in underground and aerial at IITM campus.
- Both cable was tested and verified at STL Factory in the presence of TEC Director and IITM experts.
- 4.1 km of underground cable was successfully deployed from the main gate to the Ocean Lab via open trenching & HDD.
- 1.2 km aerial section was deployed using 17 galvanized iron (GI) poles, with spans ranging from 50 to 60 meters.
- The both cable were terminated using In-house manufactured FIFO-integrated MCF FDMS for connectivity to legacy network.



UG Deployment: Digging, Trenching and Ducting, HDD, Cable Blowing



Aerial Deployment: Pole Installation, Cable Pulling & Termination & Splicing

This hybrid deployment enabled MCF-based experimentation and established a reference model for future smart campus and metro-scale fiber rollouts.

Future Use and Scalability

The MCF-based AOC test-bed by IIT Madras and STL Technologies represents a major advancement in India's optical communication infrastructure. Supported by TTDF, it enables scalable, future-ready R&D in next-generation networking.

- **R&D Acceleration:** Enables institutions, startups, and industry to perform real field validation of MCF network systems.
- **Skill and Talent Development:** Encourages generation of talent to engage with cutting-edge optical technologies.
- **Cutting-edge Technology Validation:** Real-field validation on quantum communication, advance modulation & sensing.
- **Pilot to Product Pipeline:** Real time field live test environment for early innovations stage to commercial scaling.
- **AI-Driven Network Intelligence:** AI-driven monitoring, fault prediction, and automated next generation networks.

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Strategic Impact

The MCF-deployed AOC test-bed aligns with the broader vision of the TTDF to create a self-reliant telecom ecosystem driven by indigenous innovation.

- **Empowering Make in India:** Indigenous end-to-end MCF solution development, reducing import dependency and strengthening domestic manufacturing capacity.
- **IP Generation and Global Standardization:** Test-bed enables patents, publications, and standards contributions from India on global platforms.
- **India's R&D Strengthening :** Strengthening India's **positioning in R&D**, enabling technology exports and reducing reliance on foreign technology.
- **Ecosystem Readiness:** Collaboration across academia, startups, MSMEs, and large enterprises—creating a robust innovation pipeline from lab to market.

Conclusion

STL, in partnership with IIT Madras, has successfully deployed India's first hybrid MCF-SCF cable, establishing a benchmark in next-generation future proof optical infrastructure. This stands as a landmark initiative under TTDF, reflecting India's commitment to building a self-reliant and future-ready telecom ecosystem. STL-IITM collaboration not only marks a technological leap but also exemplifies how government, academia, and industry can co-create impactful infrastructure that serves as both a research asset and a strategic national resource. . The underground armored and ADSS aerial hybrid cable deployment at IITM showcases STL's commitment to building high-capacity, scalable networks for AI, 5G, and quantum applications.

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