



sti.tech

# **multiverse**

## **Multi-Core Optical Fibre**



# Introduction

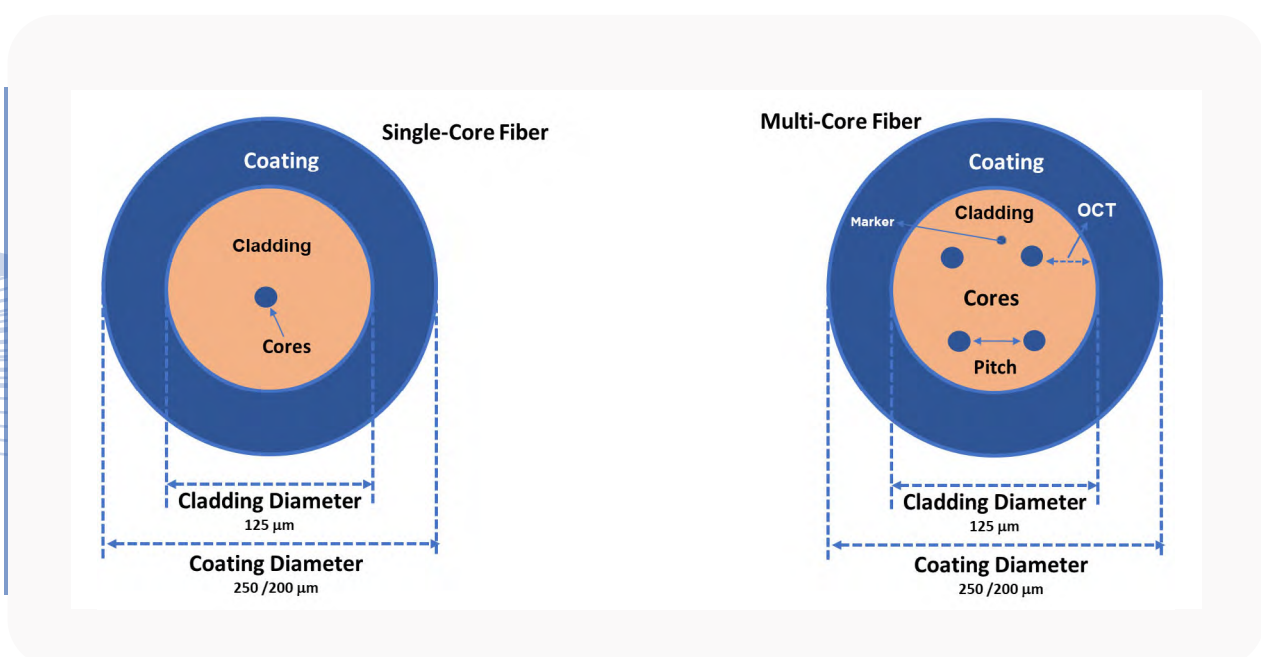
The exponential growth of data traffic at Zetta scale is being driven by continuous increase in the bandwidth consuming applications such as 12K video streaming, UHD AR/VR, 5G services and IoT applications. The current available infrastructure is not sufficient to support this growing data subscriber density. Communication network infrastructure needs to be built incorporating ultra-high data carrying transport systems. The requirement is not only for high rate transmission systems beyond 200G/400G, but also for optical fibre cable (OFC) of very high fibre count cable.

The current generation of highly compact ultra-large fibre count cable is going through a lot of innovation. Its form factor has been significantly reduced by the introduction of inter-bonded ribbon (IBR) technologies, reduced coating diameter fibres ( $< 200 \mu\text{m}$ ) and micro/macro bend-insensitive fibres such as Stellar, BOW-LITE (E) and BOW-LITE Supper (G.657.A2/ B3).

Further disruption in optical fibre cable manufacturing is the need of the hour for sustainable network infrastructure with lesser material density, ultra-compact, lighter weight and faster deployment. The information carrying capacity in single fibre can be dramatically increased by having more single modes cores with a common clad region.

## Multi-Core Fibre

Multi-core Fibre has capability equivalent to four single core fibres. This results in 75% reduction in overall surface area as occupied by single core fibres. Therefore, for a cable with the same number of fibre cores, cables with a 4-core MCF will be more compact, slimmer, lightweight than equivalent cables made of single core fibre.



**Figure 1:** Schematics of Single-Core and Multi-Core Fibre



The typical schematics of single-core single fibre and multi-core single mode fibre is shown in figure 1. The core diameter and clad diameter for single-core and multi-core fibres can be kept in the range of 8-10  $\mu\text{m}$  and 125  $\mu\text{m}$  respectively. Besides, the multi-core consists of more cores in the same clad diameter and the number of cores varies from 2, 3, 4, 7, 22, etc.

The overall coating diameter of multi-core fibre has similar dimension as standard Single Mode Fibre (SMF) i.e. 250/200  $\mu\text{m}$ .

Development of multi-core optical fibre targets to resolve data traffic problem due to high-capacity transmission. Data transmission capacity is directly proportional to the number of fibre cores. Higher number of cores increase the data carrying capacity as compared to standard SMF. Therefore, with the use of MCFs, the traditional optical fibre cable dimension can be dramatically reduced. Due to this added advantage, the Data Center Interconnect network infrastructure and backbone of C-RAN infrastructure will benefit by an extremely compact, lighter optical fibre cable that also results in faster splicing and deployment.

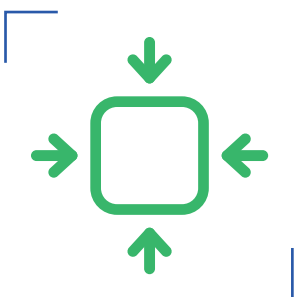
## Advantages of Multi-Core Fibre Cable

Optical fibre cables made using multi core offers multiple benefits over the conventional optical fibre:



### 1: Improved Material Efficiency

Considering the standard SMF diameter, the amount of clad glass material in a MCF will be reduced to 1/4th than what is needed for single core SMF. While the core region glass remains same as SMF, the coating material used will reduce linearly by the factor of number of cores in MCF.



### 2: Compact Form Factor

MCF will drastically reduce the OF cable diameter and weight, thus requiring much narrower trench and duct. In addition, for the given OFC diameter, with MCF fibre count can be increased in linear proportion with number of cores in MCF. For example, a loose tube cable with 864 MCF with 4 cores will translate into a cable with 3456 single mode fibres. The diameter of this cable will be around 22.5 mm.





### 3: Faster Splicing and Cable Deployment

At the OFC segment joints, splicing can be a time-consuming affair, particularly in high fibre count cables. In the MCF cable, splicing time will be inversely proportional to the number of cores resulting in reduced splicing time.

Besides the high fibre core count, MCF cable will be lighter, compact and can be blown to much longer distance in the duct than traditional OFC. This will reduce the number of cable joints and save the corresponding splicing time. Therefore, the speed of deployment of OFC can be dramatically improved thereby saving installation cost.



### 4: Lower Total Cost of OFC Deployment

The ultra-compact MCF cable needs narrower duct and trench owing to its small form factor. This significantly reduces the network installation expenses. Due to lower duct size, the amount of High Density Polyethylene buried inside the ground reduces, resulting in a more Eco-friendly solution.

## Recommendations

Owing to the sustainability they offer, MCF cables are the future of telecom infrastructure. Despite their operational issues, the readiness of MCF is a step closure towards field deployments. While the current generation MCF suffers from inter-core crosstalk, it is not at a very severe level and can support data transmission over short distances of up to 10 km range. This makes them an attractive solution for short range communication links particularly for data centre interconnect networks where a large number of high fibre core count cable is desired to support hyper scale connectivity infrastructure.

#### A leading optical and digital solutions company.

#### About STL - Sterlite Technologies Limited

STL is a leading global optical and digital solutions company providing advanced offerings to build 5G, Rural, FTTx, Enterprise and Data Centre networks. The company, driven by its purpose of 'Transforming Billions of Lives by Connecting the World', designs and manufactures in 4 continents with customers in more than 100 countries. Telecom operators, cloud companies, citizen networks, and large enterprises recognize and rely on STL for advanced capabilities in Optical Connectivity, Global Services, and Digital and Technology solutions to build ubiquitous and future-ready digital networks. STL's business goals are driven by customer-centricity, R&D and sustainability. Championing sustainable manufacturing, the company has committed to achieve Net Zero emissions by 2030. With top talent from 30+ nationalities, STL has earned numerous 'Great Place to Work' awards and been voted as the 'Best Organisation for Women'.