48-Fiber Non-Contact MPO Optical Fiber Connector Delivers 4-Fold Performance Improvement Over Well-Known Expanded Beam Connector

11/16/2016, Arrayed Fiberoptics Corporation announced: 48-fiber Non-Contact MPO (NC-MPO) multimode optical connector achieved 4 fold insertion loss improvement over the world's leading expanded beam fiber connector.

Recently, in data center applications, customers demand ever-increasing channel counts in multi-fiber optical connectors due to the growing volume of optical interconnects in networks. A high channel count fiber connector is a must for data center applications in the near future, declared COBO (Consortium for On-Board Optics), a consortium of 46 large data center related companies including Cisco, Intel, Lumentum, Juniper Networks, Microsoft, Molex, TE Connectivity, and others. Jeff Cox, senior director, network architecture at Microsoft and a COBO representative, said that his company and others with "mega-scale" data centers foresee a time in the near future when the volume of optical interconnects in their networks will require greater faceplate density than even QSFP28 optical modules will be able to support. So demand for 48-fiber, 72-fiber, and even higher count multi-fiber optical connectors is imminent.

At present, there are two options for high channel count fiber connector: the traditional physical contact MPO optical fiber connector, and the expanded beam connector (EBC).

The traditional physical contact MPO fiber connector requires that all fiber end faces achieve physical contact at the same time. Otherwise, there will be an unintended air gap between the optical fiber end faces, resulting in multiple reflections between the fiber end faces and seriously degrading the optical signal transmission. To achieve simultaneous physical contact for all fiber end faces, first all fiber end faces must protrude significantly from the surrounding ferrule surface through polishing, and then large working pressure must be exerted on the MPO connector so that the fiber end faces deform to allow all fiber end faces to make physical contact simultaneously.

The working pressure is proportional to the number of fibers; the more fibers, the greater the working pressure. The 48-fiber MPO requires such a very high working pressure that the stress on the MPO structural material becomes a design problem. At the same time, in the actual working environment, the presence of dust and other contaminants can still result in virtually unavoidable unintended air gaps between fiber end faces, making the stable, uniform optical fiber connection difficult to achieve. The greater the number of fibers in a physical contact MPO fiber connector, the poorer the connection reliability. As fiber count increases, it requires too much force, and connection reliability decreases too much, to the point that this physical contact operating principle has to be abandoned.

The same companies that developed the original MPO connectors invented a new expanded beam connector (EBC); it has up to 64 fibers. The EBC uses microlenses to expand the light beam,

which avoids the direct contact of the fiber end face and solves the problem of simultaneous fiber connection. The working pressure can be small. However, due to the introduction of more optical elements in the optical path, EBC greatly increases complexity and cost, and has poor optical performance. Multimode fiber insertion loss is as high as 1.2dB, and it is not even suitable for single mode fiber at all.

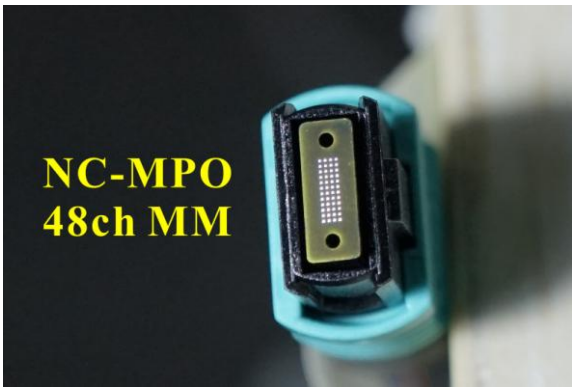

Figure 1. 48 channel multimode NC-MPO fiber connector has a visible AR coating

Unlike existing products, Arrayed Fiberoptics Corporation NC-MPO fiber connectors are coated with an anti-reflection coating on the end faces of the fibers and the ferrule surface (Fig. 1). All fiber ends are recessed below the ferrule surface to avoid physical contact when mated (Fig. 2). When the connectors are mated, there is an intentional small air gap between the end faces of the fibers. Unlike traditional MPO connectors in which the unintended air gaps between fiber end faces cause grave harm to fiber connector's connection reliability due to multiple reflections, the NC-MPO fiber connector is minimally affected by the ubiquitous unintended small air gaps because anti-reflection coating prevents multiple reflections. Therefore, the NC-MPO fiber connector is becoming recognized as an ideal multi-fiber optical connector, and this fiber connector operating mechanism works equally well for both single-mode and multimode fibers.

"The non-contact MPO is really an exciting product development," noted Jim Hasegawa, General Manager of Senko Advanced Components, Inc. "Senko sees a growing customer need for NC-MPO connectors in a variety of applications."

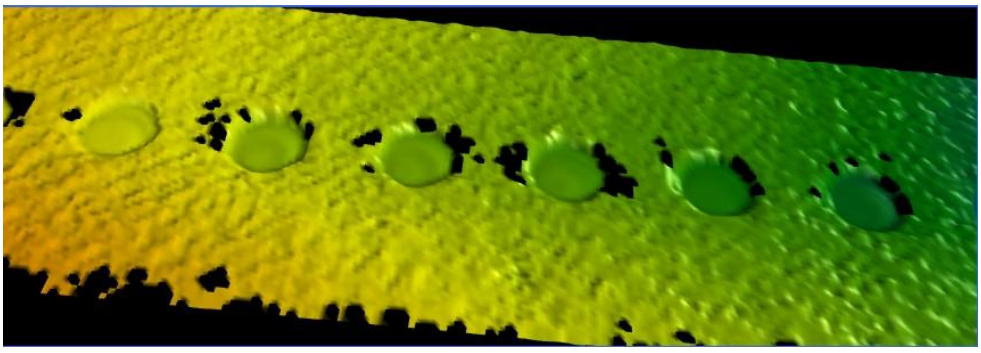

Figure 2. Fibers are recessed from the surrounding ferrule surface in a NC-MPO connector (interferometer image)

The maximum insertion loss of the 48-fiber NC-MPO multimode fiber connector announced

here is only 0.29 dB, which is a four-fold improvement over the 1.2 dB insertion loss of the EBC connector. The average insertion loss is 0.13 dB. As the 48-fiber NC-MPO multimode fiber connector has no lenses or other extra optical components, performance and reliability are greatly improved, while production cost and complexity are significantly reduced. In addition, since the fiber end face contact is not required, the working pressure can be small. In fact, the spring in the 48-fiber NC-MPO multimode fiber connector is a regular spring of a 12-fiber MPO connector.

In the 48-fiber NC-MPO multimode connector, return loss performance also has a new breakthrough in the form of an 8 ° angled 48-fiber NC-MPO multimode fiber connector, breaking the multi-mode fiber connector limitation of only 0 ° angle. The 48-fiber NC-MPO multimode fiber connector with 8 ° angle has superior performance than 0 ° angled connectors, and the return loss is lower than -70dB, exceeding the detection sensitivity of the test instrument.

In addition to multimode versions, NC-MPO fiber connectors can have high channel count single-mode fiber in the future.

Arrayed Fiberoptics Corporation is the inventor of Non-Contact fiber optic connectors (patent pending). They are now offering 48-fiber NC-MPO multimode connectors for sampling, with immediate availability.

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