Connecting People To Quality Fiber Optic Technology

DAISI, DAISI MT, The future of interferometry

The intention of this article is to discuss the major advancements in technology in interferometers rather than the theory behind interferometry.

Fiber optic connectors provide a low loss and convenient method of connecting optical circuits. Low loss is achieved by minimizing the lateral offset between optical fibers when connected and by maintaining physical contact between the optical fibers in the connection. Physical contact can be achieved when the ferrules containing the optical fibers have a convex spherical polish on the endface. By having the apex (highest point or first point of contact) of the spherical polish coincide with the center of the ferrule containing the optical fiber; the fibers have a high probability of achieving physical contact when mated together. The parameters that define the endface geometry for a physical contact (PC) ferrule are radius of curvature, height of the fiber with respect to the polished radius, and the distance between the apex of the spherical polish and the center of the fiber (apex offset).
Controlling and monitoring of all of these parameters is paramount to connector performance in the field.

The majority of interferometers on the market today for measuring endface geometry of optical fiber connectors are based on design concepts at the infancy of the industry. Many of these instruments are too complex to use in a production environment and were primarily designed for R&D use or for use by highly skilled technicians.

In today's market an ever increasing number of vendors realize the benefit of 100% testing of endface geometry for fiber optic connectors and are demanding that this information is supplied with the product. This information is essential to ensure that the connector will perform to specification today as well as in the future. To satisfy their customers demands, manufacturers need test equipment that is easy to use and calibrate, fast and very accurate and repeatable.

The Data-Pixel and Diamond design team discussed the weaknesses and flaws on interferometers currently available and addressed these issues with their cutting edge design of the DAISI and DAISI MT.

Key points of this revolutionary design are:-

1 Simple one button operation to initiate measurement.

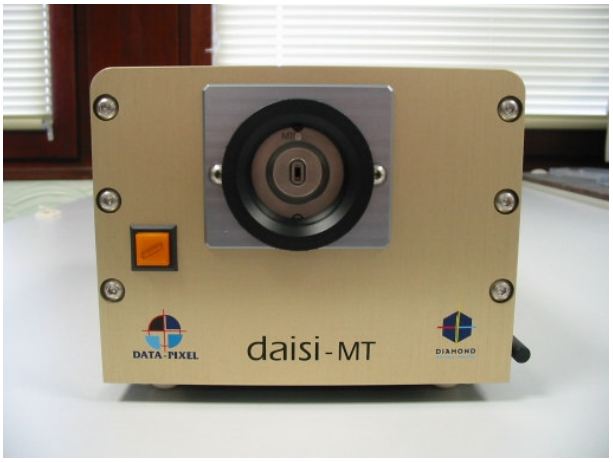
It is desirable in many production environments to limit operator's access to computers and keep them off the bench to free up space. By initiating the measurement sequence by using the front panel button it is possible with the correct software setup to have this as the only operation required to be performed by the operator. In addition since the operator has inserted the connector into the fixture it is not necessary for them to then either click on an icon or touch a keyboard.

2 Autofocus.

One of the main measurement variables that can influence the results is the point of focus of the connector under test. For optimum repeatability it is important to focus for maximum contrast on the interference fringes created by the surface topography of the connector. By using an autofocus routine it not only simplifies the operation of the equipment but also negates one source of variability.

3 No mechanical adjustments required of XY position.

This results in an extremely stable optical platform insensitive to vibration and possessing long term stability of apex offset for the DAISI and the angle of polish for the DAISI MT.



4 Automated calibration of apex offset achievable by any operator with no manual mechanical adjustments.

There are no mechanical adjustments for calibration of the apex offset as the whole sequence is controlled via software. Any operator with very little training is able to perform this calibration negating the requirement to have trained technicians on site. An added benefit to this is that the mechanics to perform this calibration have minimal pivotal distances that result in an extremely stable apex offset measurement with minimum drift with time.

5 Automated fixtures that lock for measurement cycle and release after measurement is complete to totally eliminate wear.

The major source of wear on a fixture that holds the connector is caused by the operator not unlocking the chuck before removing the connector. As the ferrules of connectors are ceramic and most fixtures are made of hardened steel it is very easy to cause rapid wear if the locking force is not released. Any wear on the fixture will result in poor repeatability of apex offset. In the case of the DAISI the locking and unlocking of the fixture is automatically performed by the software. The system always leaves the fixture in the

unlocked position after making a measurement ready for the removal and insertion of the connector under test.

6 Rapid change keying plates that require no tools to change.

The keying plates can be changed rapidly for the range of angled connectors on the market today without the requirement for any tools. Another feature of the DAISI design is the ability of the plate to float in the horizontal and vertical planes but not rotate. This is very important as the ferrule can be biased by spring pressure and never sits in the center with respect to the key. On other interferometers where the plate position is fixed, this can cause large errors in apex offset and key error readings.

7 Quick change chucks for different ferrule sizes.

It is important in a production environment that chucks can be changed quickly and easily to accept different size ferrules. With the use of dowel pins to help align the chuck the whole process is accomplished with ease.

8 ***Novel tilt stage with long pivot point allowing very repeatable and accurate calibration of 8 degrees movement.***

The main issue with other interferometers available is that the pivot distance to tilt the chuck to 8 degrees is very small. This leads to angle variability when switching between 0 and 8 degrees. Although these angle differences are fairly small the resulting apex value in microns is fairly significant.
To overcome this issue the DAISI and DAISI MT tilt the entire optics over a long pivotal distance. In addition since there is no interaction with the chuck assembly this also leads to an increase in mechanical stability.

9 Simple USB 2.0 interface.

The USB 2.0 connection in conjunction with the high resolution digital camera allows any computer (desktop or laptop) to be connected to the equipment. As no frame capture

card is required this results in a clean and simple interface and allows the system to be used in the field with a laptop PC.

The DAISI MT goes even further with its patent pending fixturing for MT connectors resulting in the highest angle repeatability in the industry. No other manufacturer can offer a package that is so compact, fast and insensitive to vibration.