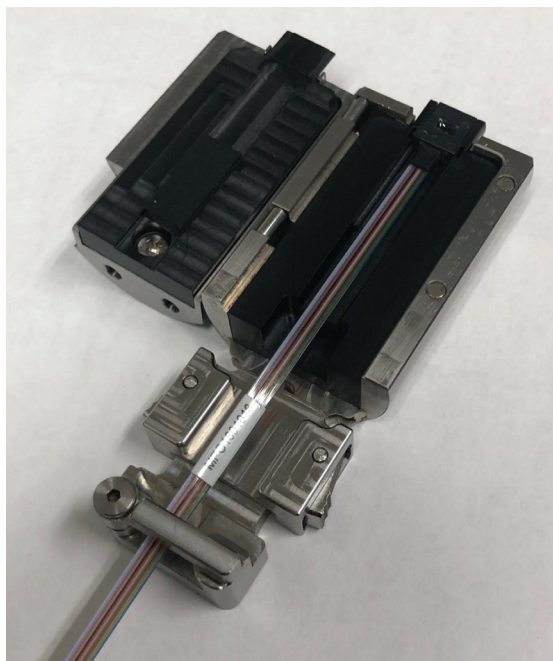


# High-Speed, Cost-Effective Fiber Array Unit Testing with MAP-300

# INTRODUCTION

As the AI-enabled world grows at increasing speeds, the demand for ultra compact optical connectors is growing with it, particularly to enable Co-Packaged Optics (CPO). Manufacturers and integrators alike are looking for easy-to-execute, high throughput and cost-effective options for performing optical alignment. As the Fiber Array Unit (FAU) becomes more common, manufacturing partners have seen a targeted effort from VIAVI to enable growth through the MAP-300 platform, leveraging decades of industry leading expertise.



FAU inside of the AC950 + AC951 Holder

The world leading VIAVI [Multiple Application Platform \(MAP\)](#) architecture has led the production test market for over 15 years and constantly innovates to keep production environments fast, small and cost effective. The MAP system is the top tier production tool for manufacturers and labs that want to have access to market-leading modules, open automation tools and cost-effective scaling as they grow.



The MAP300 mainframe family

While testing optical fibers seems far simpler than testing a customized FAU, the same principles still apply to measure insertion loss and return loss correctly, even before thinking about data management and workflow optimization. This note will cover the requirements of accurate IL/RL testers, challenges with other testing methods, and explains how the MAP-300, with VIAVI's decades of industry-leading expertise, can deliver on your optical communications testing requirements.

## Accurate Optical Testing of Fiber Array Units


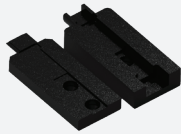
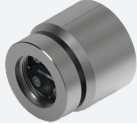
Manufacturing and integration of Co-Packaged Optics requires well-designed testing protocols at every stage. The FAU qualification accuracy requires that the test solution meets basic requirements:

1. **Highly stabilized light source.** There are two major approaches to controlling the output power of a laser over temperature. While ultra-precise designs and overengineered thermal controls can be an effective design, the more cost-effective method for manufacturing and integration test is to have an internal power meter to track the source power drift of the laser. The mORL from VIAVI does exactly this, relying on world class, VIAVI-designed power meters to ensure that regardless of your testing environment, the power of the system is exceptionally well known at every instance in time, for every measurement and channel.
2. **Depolarized light source.** One of the most common mistakes in optical testing is to ignore the effects of polarization on insertion loss and return loss measurements. Especially in the era of silicon photonics and circuit-level optical connectors, leveraging a depolarized source is critical to ensure the measurement of insertion loss is not accidentally a measurement of polarization dependant loss (PDL). While sources exist that are depolarized off the laser chip, the most cost-effective solution is the VIAVI mORL which has an internal and proprietary ability to depolarize the light source even before the light leaves the module.
3. **Repeatable channel selection method.** While almost every solution on the market makes use of switches for controlling which channel in the FAU is being measured, no switch on the market has the proven performance of the VIAVI in-house designed and manufactured mOSW line. This modular add-on to the PCT architecture allows you to choose how many channels you want to test, saving you capital while improving the precision of your switches.
4. **Ultra-precision power meters.** VIAVI's 35-year legacy of producing world class power meters has sustained partner test needs and grown with new requirements at every step. VIAVI offers on-module power meters, and remote heads to bring the power meter to where you really need it for easy testing workflows. The AC adapter series from VIAVI has fiber adapters for all testing scenarios including direct FAU splice chuck holders, bare fiber adapters and MPOs. Whatever form your connector or FAU takes, there is an adapter for you.



The AC Adapter Series' most common adapters

5. **A repeatable and temperature independent integrating sphere.** For FAUs specifically, in contrast to single fiber testing, an integrating sphere is required to make measurements of all channels without moving fibers. VIAVI has multiple classes of integrating spheres to meet your exact needs. Whether an inline adapting integrating sphere, or an integrating sphere mounted into a remote head package, VIAVI provides the best uniformity of any integrating sphere in-class.
  
6. **Mechanically robust mounting systems and adapters.** When in production or integration environments, dealing with vibrations or human movements must be considered. VIAVI adapter series has mounts designed to mitigate vibrations and human movement during test so that no operation is wasted, and every result is trusted. Included in this adapter design is the AC950 system that allows for a universal adapter system:

|  |  |
|--|--|
| <p><b>1</b> The clamshell holds the adapter insert (either VIAVI supplied or custom made by customer). This is a required piece.</p>   | <p>Clamshell Adapter</p>      |
| <p><b>2</b> The adapter insert is a public, replaceable interface to the Universal Adapter System. VIAVI offers several pre-configured variants. Customers can make their own as well.</p> | <p>Ferrule Insert</p>         |
| <p><b>3</b> The barrel holder magnetically secures the clamshell into place and attaches to a VIAVI power meter.</p>   | <p>Barrel Holder (AC950)</p>  |
| <p><b>4</b> The barrel assembly aperture plate comes in three different variants, including small circle, large circle, or slit options.</p>   |  |

The AC950 Universal Adapter System

7. **The FAU must be clean.** When testing goes wrong, it is primarily because the fiber or connector is not clean, and a bad connection is made. A dirty fiber or FAU threatens to damage or destroy every fiber that it encounters. Removing impediments and inspecting fiber systems is a critical component of effective test solutions. VIAVI is the only supplier of IL/RL test equipment that also delivers world class inspection equipment and cleaning solutions so your fibers don't create problems for your application or your customers' applications. The VIAVI FMAX and FMAG adapters series are also fully compatible with the AC950 series to allow easy transition from inspection to measurement.



FMAG Adapter with AC950  
FAU Adapter for Inspection

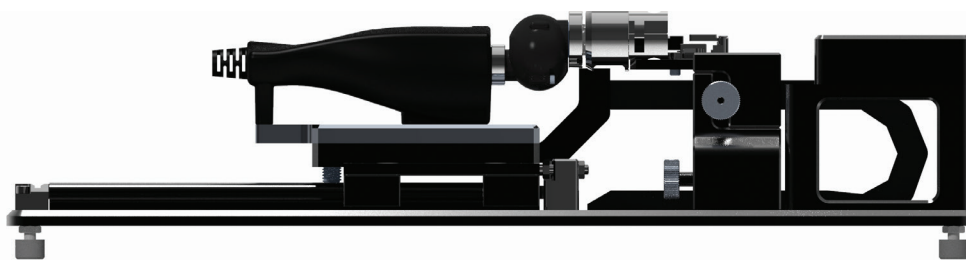
## What Goes Wrong?

When a test system fails to measure IL/RL correctly for a FAU, there are many possible reasons, but a few are more common. With the MAP architecture from VIAVI and VIAVI-designed inspection and cleaning tools, all of these are fully mitigated.

Many market solutions require a mandrel wrap requiring physical manipulation of the FAU which risks damaging the FAU itself. Any solution that uses Optical Continuous Wave Reflectometry (OCWR) requires either that the FAU itself is mandrel wrapped, or ignores contributions to the test results from the test leads themselves. VIAVI's PCT architecture on the mORL module circumvents this problem by leveraging a different class of technology to make enhanced measurements of the FAU or other Device Under Test (DUT) without physical manipulation.

Accurate measurements are further clouded by a lack of traceability. Answering why you should trust a measurement is impossible without both a measurement standard and traceability to a known value. With the VIAVI MAP system and all products hosted on the MAP (including the mORL), every measurement is IEC compliant and traceability to NIST standards, including implementations within inspection equipment to qualify cleanliness against IEC standards.

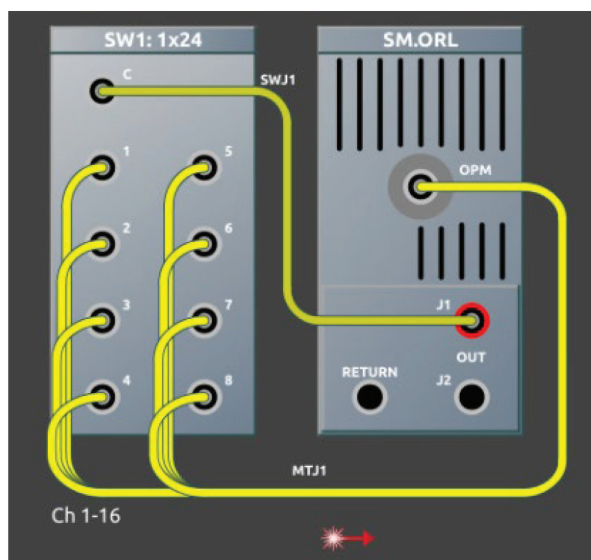
Operator mistakes create throughput bottlenecks and limit capacity. VIAVI systems are uniquely designed to accommodate ergonomic practices and limit operator fatigue and resulting operator errors. The AC1100 sliding fixture exemplifies the improvements to operator comfort that VIAVI has created.



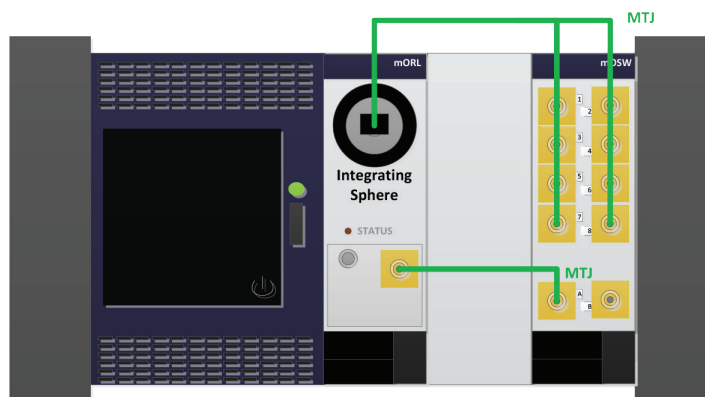
AC950 and AC951 adapters attached to an integrating sphere (AC991S) and  
OPM remote head on an AC1100 sliding fixture

## What does FAU testing on MAP-300 look like?

Testing with MAP-300 is and has always been user-driven. Every feature has your tester in mind, and testing FAUs is no different. The test procedure for FAU testing on an mORL requires two steps. First, a reference needs to be made. This reference should be taken about once per day or per thousand connections to the test lead. The User Interface of the PCT guides users on exactly how the system should be connected for their reference.

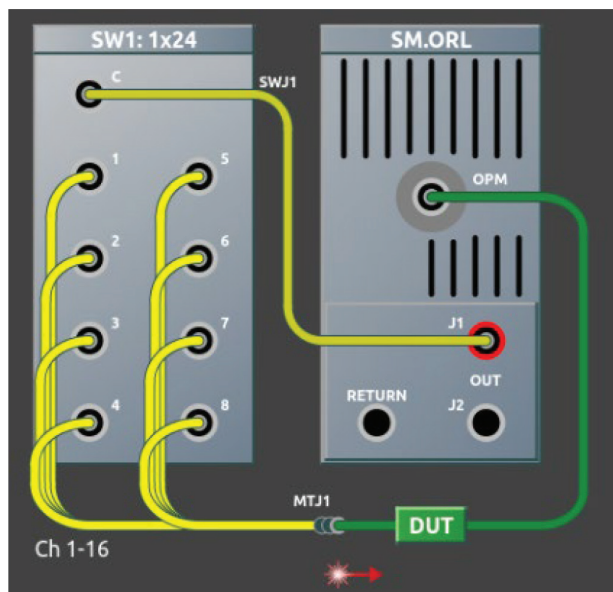


16 Channel Reference example User Interface

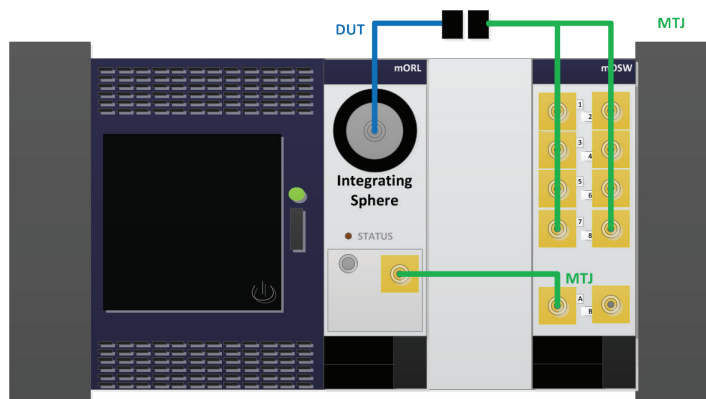


Hardware layout for a FAU reference

Once the reference is completed, the user is ready to measure all day. The measurement is equally simple, simply connect the DUT into the system (the User Interface again helps users know exactly what to do).

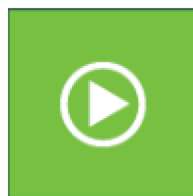


16 Channel Measurement example User Interface



Hardware layout for FAU measurement

After connecting the DUT, the user simply clicks the green measure button:



Easy to use buttons exist throughout the User Interface

The process is now complete. After two clicks and pictographic steps, the user has measured the insertion loss and return loss of the FAU without any training.

## Conclusion: What Now?

VIAVI market leadership in optical test and measurement, coupled with innovative inspection and cleaning products, uniquely enables manufacturers to test FAUs with high throughput and workflow enhancements. The accuracy of FAU testing requires thoughtful planning and implementation, and will directly contribute to your reputation in the AI landscape.



Many peripherals can be easily added to the PCT workflow

## VIAVI Can Help

As the number of fiber channels in the world continues to grow year-over-year exponentially, the demand for fast and versatile test systems has never been more critical to relieve process bottlenecks. VIAVI is the market leader for optical test and measurement systems that will lead you into the future of high-volume, high-performance and cost-effective optical manufacturing.

To learn more, [contact a product expert in your region](#) or [request a demo](#).



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