experior photonics
TEST SERVICES FOR FIBER OPTICS

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Applying Best Practices in Component Qualification Testing Increases Efficiency

With the current deployment of FTTx networks, the industry is experiencing a dramatic increase in fiber optic component qualification testing to ensure that tomorrow's networks meet the reliability requirements of today's POTS (Plain Old Telephone Service) networks. Some of us have already gotten used to the fact that our DSL service isn't always available or that attempts to dial up to our local ISP fails during busy hours in the evening. However, talking about "Triple Play" means that FTTH networks must ensure the same reliability we have become accustomed to from our regular telephone service. Imagine dialing 911 during an emergency only to find that "the service is kind of slow during busy hours of the day".

Component and system qualification testing is an essential step in ensuring uniform performance standards among fiber optic components. These qualification tests are labor intensive, time consuming, and require significant testing hardware encompassing fiber optic test instrumentation, electronic test equipment and specialized environmental chambers. It is often the critical technical nuances and practices used in and around the qualification test lab that determine the effectiveness of the test and level of customer satisfaction - whether these customers are internal to the organization, or external.

Key practices are those that affect the overall testing time and/or man hours required to complete a particular task and those practices that directly affect the quality and accuracy of the testing itself. Examples include:

I. Temperature Stabilized Source Monitors

It is a common practice to monitor the source power of light sources during tests that require measurements over extended durations. The typical measured parameter is *Change in Transmission* or *Change in Attenuation*. A possible drift in the source power should be taken into account when analyzing the test results. A fiber optic splitter is typically used to branch a portion of the source power off to a separate optical power meter. Fiber optic splitters exhibit a non-zero change in attenuation over varying lab temperature conditions. Multimode couples might additionally exhibit a change in coupling ratio over varying lab temperature conditions. To minimize the additional uncertainties, the fiber optic splitter assembly can be mounted on a heater (for example a resistive heat pad) and tightly controlled at a temperature above the maximum ambient lab temperature (for example 85°F). This greatly improves the overall stability measurement and reduces variations in long term measurements.

II. Generating General Overfill Launch Conditions for Flexible Multimode Sources

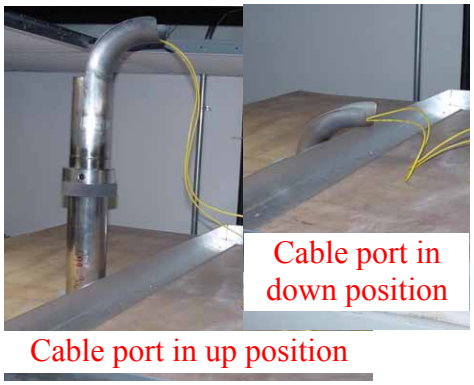
Sources for multimode measurements often have restricted launch profiles when used to fully fill multimode fiber optic components. A multi-channel multimode test system often uses a fiber optic switch to accommodate testing of multiple concurrent channels. These multimode switches are manufactured using a specific fiber core size diameter, which practically limits the test system's use to multimode components of the same size. Specialty step index fiber can be used on the switch output to scramble the modes and accommodate virtually any fiber core diameter. The step index cables are then followed by reference quality jumpers that match the cable under test in specification and physical characteristics. This allows the same basic test system to be used for measurements on any multimode cable diameter requiring only a simple change in the launch cable setup and eliminating the need for multiple fiber optic switches.

III. Automated Data Acquisition

Qualification testing requires a large quantity of data acquisition. These measurements typically include optical performance data from the test samples and temperature or mechanical stress data from the test apparatus. Automated software tools allow this data to be collected from a single master location. Since the software must communicate with various instruments from different manufacturers, it is typically custom developed in-house. Furthermore, this software architecture allows the laboratory to accommodate differing test articles and parameters. Flexible software tools enable remote programming and control of environmental chambers and organized data acquisition of all temperature, optical, mechanical, and electrical performance data simultaneously.

IV. Fixtures that Protect the Test Samples During Test

Fiber optic components and cables are fragile and must be protected properly when routed to and from the test chamber. The following example illustrates a custom designed cable port and cable routing platform on the top of a thermal shock chamber which allows *loss free* routing of cables into and out of the chamber during test.



V. Physically Separating Optical Measurement and Environmental Equipment

Environmental test chambers and vibration equipment generate significant heat during operation and are therefore often kept in a non-air conditioned room. Such an environment is not conducive to the operation of fiber optic test equipment that relies on highly stable thermal conditions in order to meet long term measurement stability requirements. Maintaining optical measurement equipment in an air-conditioned environment is critical and can be accommodated by routing the fiber optic cables through a separating wall. In addition to the enhanced stability of the test system, this arrangement greatly reduces the performance degradation issues that arise from mating and de-mating fiber optic connectors in a typical uncontrolled, open-ceiling, "warehouse-type" environment.

These are only a few examples on how the qualification testing process can be improved and yield better, more accurate, and more consistent results. Working with a qualified partner or service provider that focuses on performing these qualification tests on a day-to-day basis will add a significant increase in efficiency and quality to the overall testing process.

Based in Newbury Park, Calif., Experior Photonics provides qualification and design verification testing services to the fiber optics industry. With experienced industry veterans in its technical staff whose expertise in fiber optic measurements and component reliability testing originated from work at Rifocs Corp. and Bellcore/Telcordia, Experior Photonics is the only commercial testing services laboratory dedicated solely to fiber optic component testing.

For more information about Experior Photonics' fiber optic component testing services, please contact Lorenz Cartellieri at (805) 499-3000, or Email lcartellieri@experiorphotonics.com.