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# Field Testability and Diagnostics considerations for EFM fiber links

802.3ah Optics Sub Task Force

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Others?

# Goals

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- Use field testability and diagnostics as one criteria for evaluating different PMD proposals
  - e.g. is a single wavelength P2P better than, worse than, the same as a dual wavelength from a testability/diagnostic perspective?
- Consider field testability of fiber links to simply installation and during maintenance activities by technicians in an access network
- What's not a goal?
  - Not proposing that IEEE optics group write test or diagnostics procedures as part of the standard document

# Terminology

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- Field testability could be defined as the ability for field techs to readily test a fiber link with commonly available optical test equipment, testability is a plus for operators to deploy and maintain EFM links
- Diagnostics could be defined as the robust ability to diagnose degradations with the physical link both visual for techs and through alarms to EMS
- Note: access and enterprise definitions probably differ, suggest alternate terms as needed

# Fiber field testing today in access networks

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- Most operators equip field forces with the following fiber optic test equipment:
  - Fiber optic power meter, or loss test set w/source(s) for double ended tests
  - Optical Time Domain Reflectometer (OTDR)
  - Optical return loss meter (less commonly utilized in practice)
- Dual window test capability for 1550 & 1310 nanometers is commonly combined in single test box
- Majority of fiber systems are dual fiber (SONET) in fiber networks in access and transport today
- Single fiber, bidirectional links are new, the systems should attempt to re-use existing fiber test sets with simplified field testing procedures

# Draft list of methods to increase field testability

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1. Testing source power on a single fiber bidirectional link requires the transmitter to have constant output (cw) when connector is removed and link is disconnected
2. Tech will need to confirm the output power for P2P and P2MP OLT at turn up and during maintenance testing. The output power measured has to be correlated to specifications of the equipment based on the IEEE standard. (OMA vs ER debates)
3. Field testability would be increased if disconnected P2MP ONT would emit power for field testing
4. Single ended testing that requires only one tech and not a tech on each end (double ended) are preferred to save operational dollars
5. Return loss measurement of the optical network not always done today, systems requiring better fiber network return loss is a concern. Look at systems deployed with success today as a guideline for optical return loss and point reflection

## Draft list for ways to enhance diagnostics

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- Diagnostics that can indicate when return loss is the root cause of a link failure would be beneficial
- Diagnostics (alarming) to remotely acquire performance of the optical signals is required, i.e. loss of signal, threshold crossing, other?
- P2MP diagnostics are critical to isolate problems particular to specific stations, this allows intelligent dispatching to end station locations in trouble state
- P2MP diagnostics to isolate faults between cascaded splitters going to be valuable to operators
- Non-traffic affecting optical testing methods could be used by operators, e.g. OTDR maintenance wavelength of 1625 nm.

# Conclusion

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- Develop a common understanding of field testing in access networks
- Remember that single fiber, bidirectional fiber systems (P2P and P2MP) are new to some large operators
- Introduce PMD's that re-use existing optical test sets and OTDR's widely found in access network today
- Expand upon draft list of field testability and diagnostic criteria as necessary for choosing from PMD options under debate
- Consider how enhanced OAM functionality could enhance diagnostics for fault isolation especially P2MP
- Use field testability and diagnostics criteria for evaluating different PMD proposals (e.g. is a single wavelength better than, worse than, the same as a dual wavelength from a testability/diagnostic metric?)