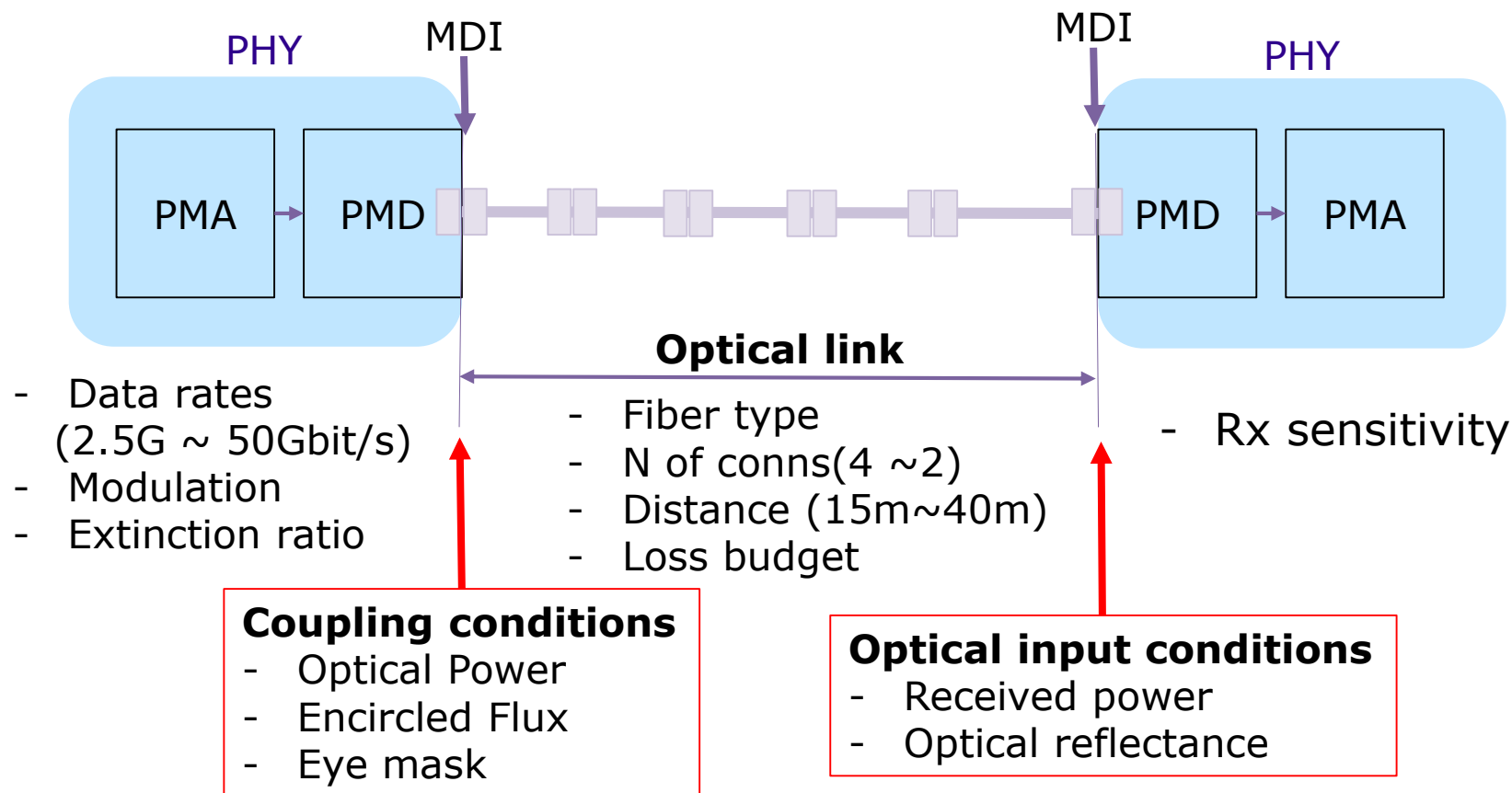# Introduction to ISO24581 (Automotive Optical Harness standardization)

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December 15, 2020

IEEE802.3cz Specification

PHY   MDI   MDI   PHY

| PMA | → | PMD | ... | PMD | → | PMA |

Optical link

- Data rates (2.5G ~ 50Gbit/s)
- Modulation
- Extinction ratio

- Fiber type
- N of conns(4 ~2)
- Distance (15m~40m)
- Loss budget

- Rx sensitivity

Coupling conditions
- Optical Power
- Encircled Flux
- Eye mask

Optical input conditions
- Received power
- Optical reflectance

About passive component specifications, it is better to discuss separately from IEEE802.3.

About MDI specification

IEEE802.3cz task force is to discuss MDI (Media Dependent Interface) specification to define optical coupling loss and other conditions.

IEEE802.3cz shall specify necessary and sufficient requirements for up to 50Gbit/s transmission.
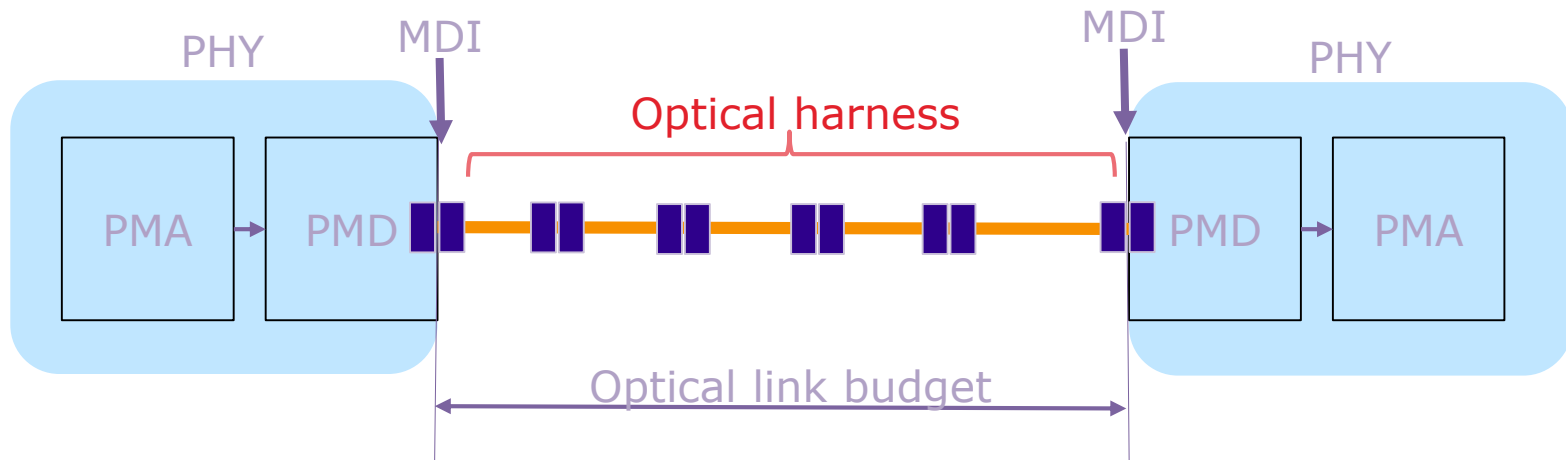
Optical interface conditions to be defined in IEEE802.3 :
- Fiber specifications
- Optical coupling power (average, OMA)
- Optical Power distribution (Encircled flux)

Optical coupling
(butt-coupling or EBO)

FERRULE   VCSEL/PD

Wire plug
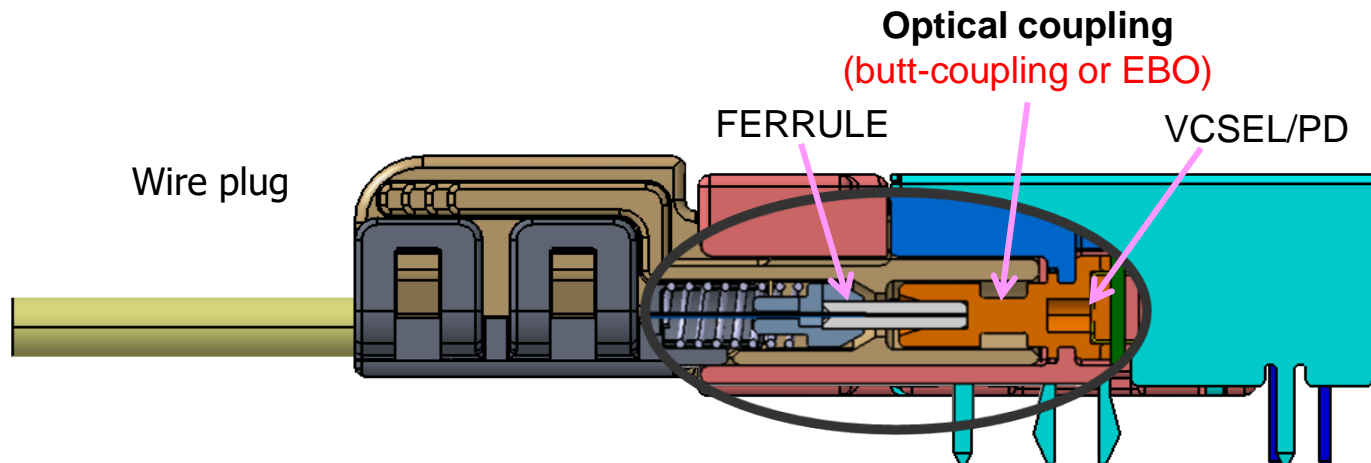
Optical coupling conditions is the issues to be specified in IEEE802.3.

IEEE/ISO work segregation

PHY specification : **IEE802.3cz**

- -

Optical harness specification (& test methods) : **ISO/PWI 24581**

- mechanical strength
- chemical / environmental durability
- cable & connector test methods & criteria
- reliability

For automotive:
  ISO16750 (W/H)
  ISO8092 (Connector)
  ISO19642 (Cable)

The optical component specifications and test methods have been specified by ISO TC22/SC32/WG10.

ISO21111-4:2020 (1Gbps optical Ethernet)

Road vehicles – In-vehicle Ethernet – Part 4:

General requirements and test methods of optical gigabit Ethernet components

This document specifies the optical components requirements and test method for optical gigabit transmission of in-vehicle Ethernet. Safety (electrical safety, protection, fire, etc.) and electromagnetic compatibility (EMC) requirements are outside of this scope.

- Header connector   Heat tolerances
- Cable connector   Dimension criteria, Heat tolerances
  (Cable plug & socket)
- POF and POF cable   Basic characteristics, Heat tolerances
  Stress tolerances, Flame proof
- Optical channel   Optical characteristics, Physical tolerances
 Automotive environment tolerances
- Annex   System power budget

ISO 21111-4 has been published since Sept. 2020.

New Activity: ISO/PWI 24581

TC22/SC32/WG10 is now starting for the standardization of optical fiber harness for future (higher speed) automotive application.

Title:
General requirements and test methods of in-vehicle optical harnesses for up to 100Gbit/s communication

(Optical PMD transmitter and optical PMD receiver devices are not included)
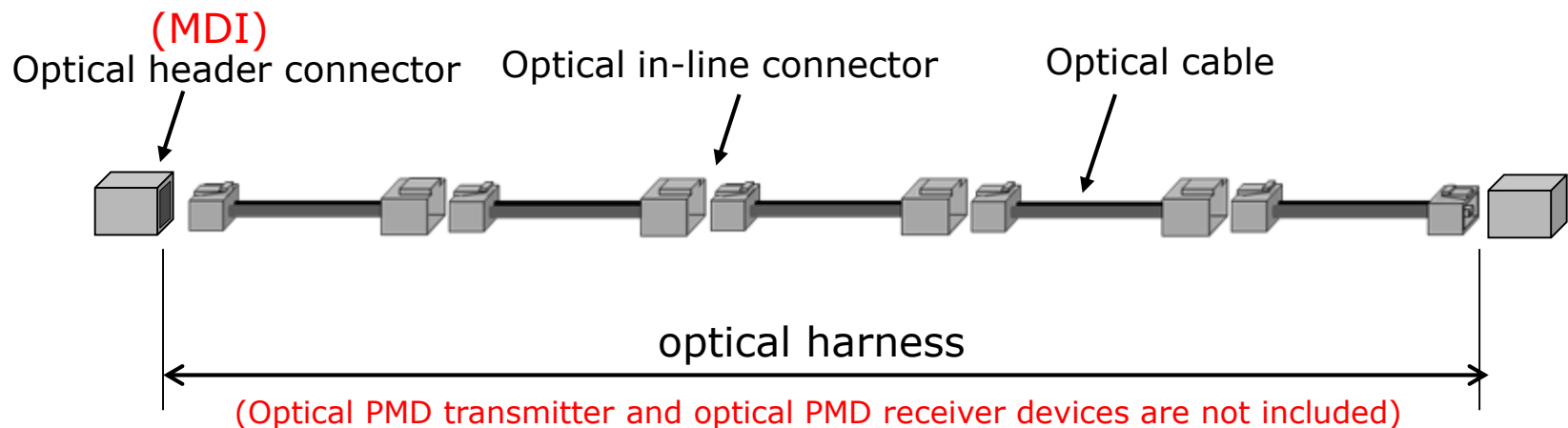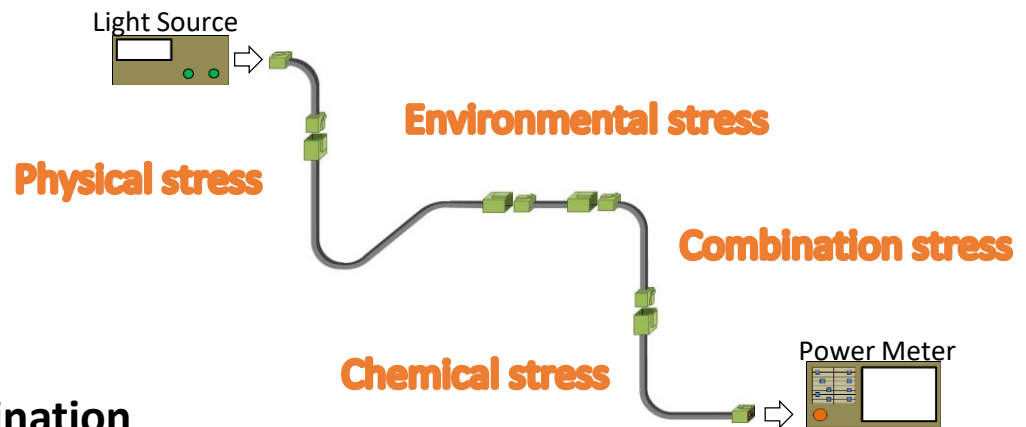
ISO/PWI 24581 documentation

ISO 24581 contains general requirements and test methods of **optical harness for in-vehicle high-speed communication**. Optical harness defined in ISO 24581 may cover any applications not only for higher data rates but also for longer distances without any limitations for data protocols. Therefore it is applicable for articulated-bus for public transportation and/or large-trailer for logistics too.
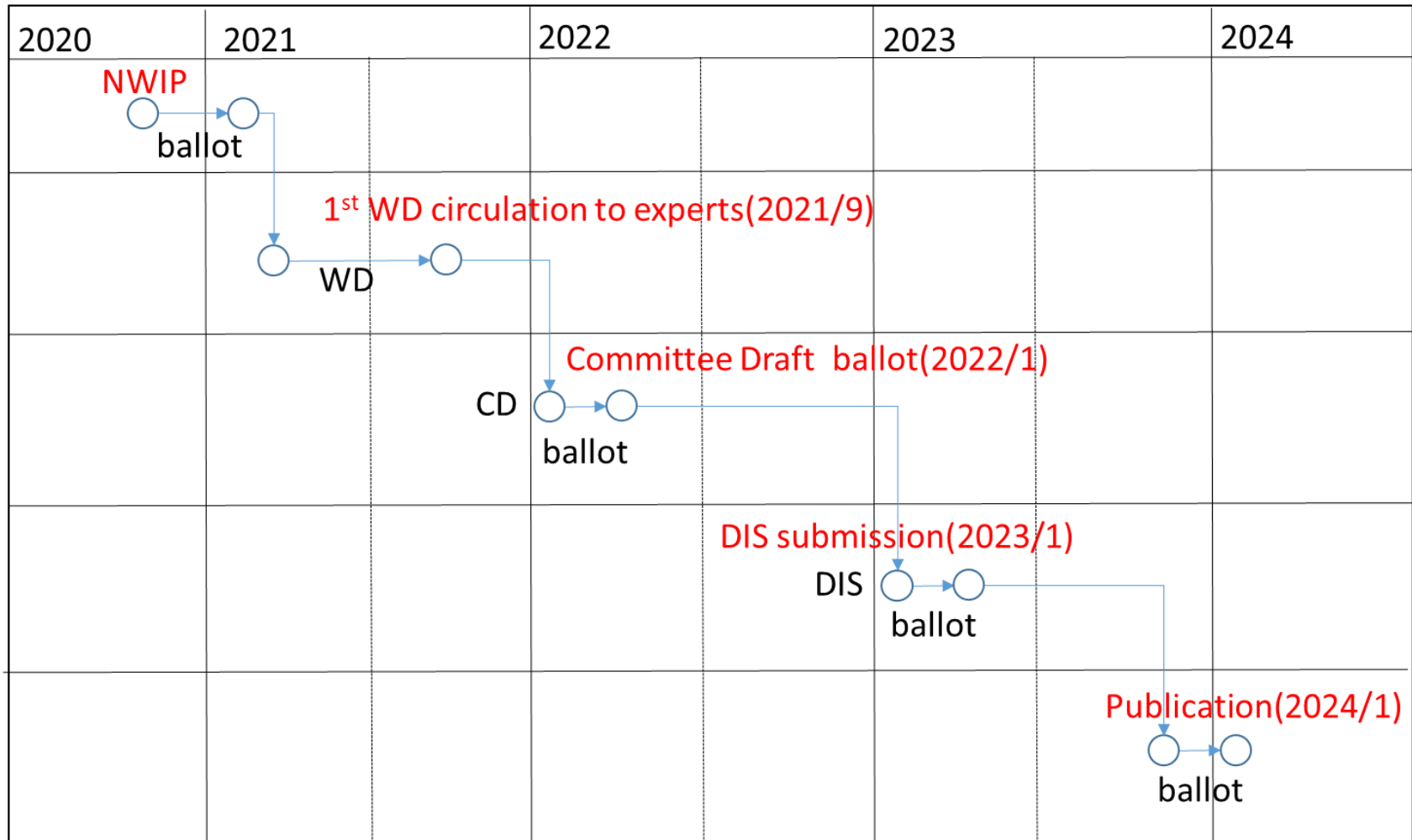
0. Introduction
1. Scope
2. Normative references
3. Terms and definitions
4. Symbols and abbreviated terms
5. **Optical channel**
6. **Optical cable**
7. **Optical connector**
8. **Optical harness reliability**
9. **Combined environmental examination**

Annex A (informative). System power budget consideration
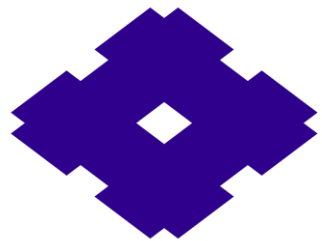Annex B (informative). System power budget calculation

Light Source

Physical stress

Environmental stress

Combination stress

Chemical stress

Power Meter

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ISO24581 standardization timeline

Summary

■ IEEE802.3cz shall focus on functional specifications of Automotive optical PHY (2.5Gbps – 50Gbps).

■ High-speed optical harness (incld. connector and cable) for automotive will be specified in ISO 24581.
  - TC22/SC32/WG10 has been working as Study Group.
  - NWIP (New Work Item Proposal) has issued in Nov. 2020.

■ Collaboration is necessary to determine :
  - Optical Loss Budget
  - MDI (Media Dependent Interface)

It is good to be specified in ISO 24581 about the optical components and test methods for automotive network.

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