Proposed baseline texts for 1000BASE-T1 PMD sub clauses

(MDI return loss, MDI fault tolerance and EMC requirements)

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Outline

- Base line text is suggested for
  - MDI fault tolerance
  - MDI return loss
  - EMC requirements

MDI fault tolerance

- Short between data wires
- Short data wires to GND
- Short data wires to power supply less than 50 V (or TBD) with current no exceeding 150 mA (or TBD)
- Power interruption and resumption of service in 100 mS
- High voltage transient noises
- ESD

Baseline text for MDI fault tolerance

97.8.2.3 MDI fault tolerance

The wire pair of the MDI shall, under all operating conditions, withstand without damage the application of short circuits of any wire to the other wire of the same pair or Ground potential or positive voltages of up 50 V (or TBD) for an indefinite period of time and shall resume normal operation after the short circuit(s) are removed. The magnitude of the current through such a short circuit shall not exceed 150 mA (or TBD).

In the event of power loss and upon return of power, a 1000BASE-T1 PHY powered through MDI shall resume normal operation without any operator intervention within a time period specified in clause 97-??.

The wire pair of the MDI shall also withstand without damage high voltage transient noises and ESD per application requirements.

Sources:

- IEEE 802.3 clauses 40.8.3.4 and 55.8.2.3
- Wienchowski_3bw_02_0914.pdf (AUTOMOTIVE VOLTAGE AND FAULT CONDITIONS, IEEE 802.3bw –September 10, 2014 Natalie Wienckowski)

Baseline text for MDI return loss

97.8.2.1 MDI return loss

The differential impedance at the MDI for each transmit/receive channel shall be such that any reflection due to differential signals incident upon the MDI from a balanced cabling having a nominal differential characteristic impedance of 100 Ω is attenuated, relative to the incident signal as per the relationship;

$$\text{Return Loss } (f) \geq \begin{cases} 18 - 18\log_{10}\left(\frac{10}{f}\right) \text{ dB} & \text{for } 1\text{MHz} \leq f \leq 10\text{MHz} \\ 18 \text{ dB} & \text{for } 10\text{MHz} < f \leq 100\text{MHz} \\ 18 - 16.7\log_{10}\left(\frac{f}{100}\right) \text{ dB} & \text{for } 100\text{MHz} < f \leq 600\text{MHz} \end{cases}$$

where f is the frequency in MHz.

Sources:

- IEEE 802.3 clauses **40.8.3.1** and **55.8.2.1**
- **pan_3bp_01_0115.pdf** (MDI Return Loss Limit Proposal for 1000BASE-T1 Atlanta, GA January 11, 2015, Hui Pan, Ahmad Chini)

Baseline text for EMC requirements

97.5.1 EMC Requirements

A system integrating the 1000BASE-T1 PHY shall comply with applicable local and national codes, or as agreed between customer and supplier, for the limitation of electromagnetic interference.

Direct Power Injection (DPI) and 150 Ohms emission tests for noise immunity and emission as per 97.5.1.1 and 97.5.2.2 shall be used to establish a baseline for PHY EMC performance. These tests provide a high degree of repeatability and a good correlation to immunity and emission measurements. Additional tests may be needed to verify EMC performance in various configurations, applications and conditions.

Baseline text for EMC requirements (continued)

97.5.1.1 Immunity - DPI test

Radio frequency Common Mode (CM) noise at the PHY is the result of electromagnetic interference coupling to the cabling system. The sensitivity of the PMA receiver to radio frequency noise shall be tested according to DPI method of IEC 62132-4 with the test circuit and limits agreed between customer and supplier.

97.5.1.2 Emission - 150 Ohms conducted emission test

Radio frequency emission may result from conducted CM signal at MDI. The conducted CM emission of the PMA transmitter to its electrical environment shall be tested according to the 150 Ohms direct coupling method of IEC 61967-4 with the test circuit and limits agreed between customer and supplier.

Sources:

- IEEE 802.3 100BASE-T1 specifications
- IEC 62132-4 (Integrated circuits – Measurement of electromagnetic immunity 150 kHz to 1 GHz – Part 4: Direct RF power injection method)
- IEC 61967-4 (Integrated circuits – Measurement of electromagnetic emissions, 150 kHz to 1 GHz – Part 4: Measurement of conducted emissions – 1 Ω/150 Ω direct coupling method)

Conclusion

- It is suggested that the texts provided in this presentation are adopted for 1000BASE-T1 specification under:
  - Sub clause on: **MDI fault tolerance**
  - Sub clause on: **MDI return loss**
  - Sub clause on: **EMC requirements**