ETHERNET PHY TRADEOFFS TO CONSIDER

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PARAMETERS TO CONSIDER

All of the following parameters impact the PHY design. They also affect each other.

- PAM levels – number of distinct voltage levels transmitted
- Power consumption – Watts consumed by the PHY
- Cable performance – Maximum usable frequency of the cable
- EMC performance – Ability to meet emissions and immunity requirements
- Number of pairs
- Data transmit frequency – Baud rate bits are transmitted on the bus

RELATIONSHIPS

Bit rate ≈ PAM levels * Data transmit frequency

Cable performance ≈ Data transmit frequency * 1.4 (see Farjadrad Nov 2017)

Power consumption α Data transmit frequency

- Higher frequency requires more power due to more transitions per second
- Typically requires FEC that covers more symbols in a given time

n wire pairs ≈ Data transmit frequency / n

PAM levels α EMC performance

- More PAM levels improve Emissions performance and degrade Immunity performance

RESULTS

Communication bit rate is fixed, e.g. 10 Gb/s

- ↓ PAM levels
  - ↑ Data transmit frequency
  - ↑ Power Consumption
  - ↓ Emissions
  - ↓ Immunity

- ↑ n wire pairs
  - ↓ Data transmit frequency
  - ↑ PAM levels
  - ↓ Power Consumption
  - ↑ Emissions
  - ↑ Immunity

RECOMMENDATION

- Keep in mind the fact that all parameters are intertwined
- There are always tradeoffs
- The tradeoffs should be defined as specific relationships may vary
- OEMs can use the tradeoffs to determine which combination(s) provide the best system cost vs. performance solution

QUESTIONS?