# Signaling rate range

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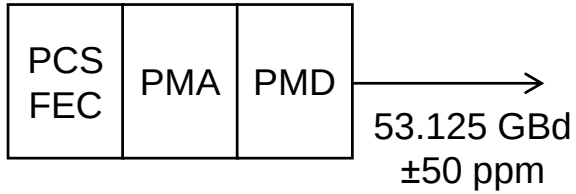
# Assertions

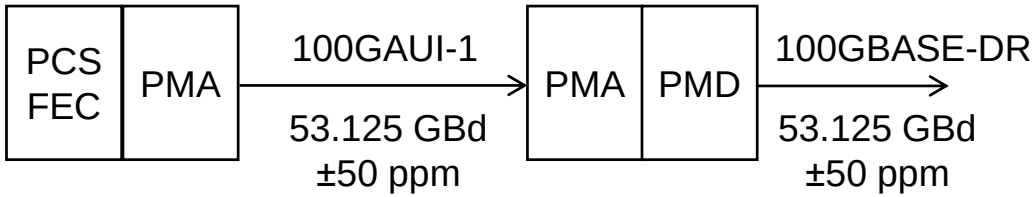
- While ±100 ppm is the “traditional” range for signaling rate, ±50 ppm frequency references could be used without meaningful impact to cost
- Multiple Ethernet PHYs already specify higher precision references, e.g.,

| PHY(s) | Reference | Tolerance |
|---|---|---|
| nGBASE-T (n = 2.5, 5, 10, 25, 40) | IEEE Std 802.3-2018 | ±50 ppm |
| nGBASE-T1 (n = 2.5, 5, 10) | IEEE P802.3ch / D3.2 | ±50 ppm |
| 100GBASE-ZR | IEEE P802.3ct / D1.2 | ±20 ppm |

- A smaller signaling rate range may be leveraged to improve performance margin (implementation-dependent)
- This presentation considers migration to a higher precision reference and compatibility with “legacy” designs

# Compatibility considerations



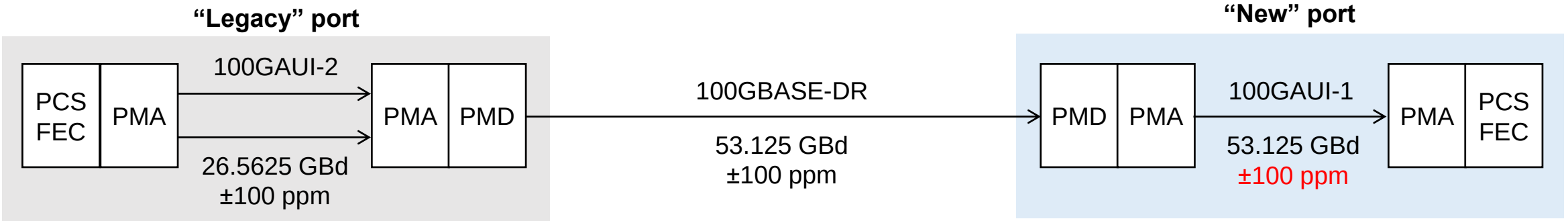




**No obvious issues for integrated PHYs**

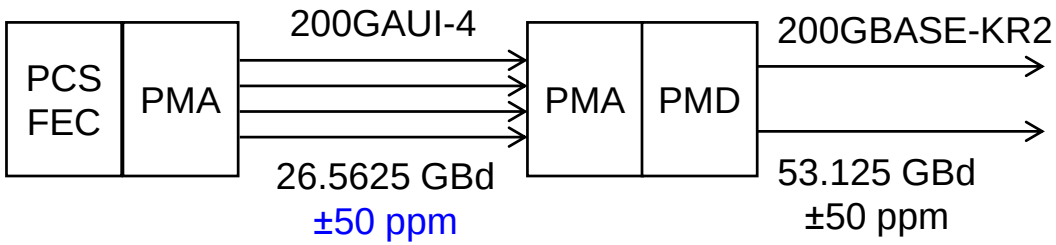
**PMA output inherits the frequency precision of its input**

**This is not an issue for a co-packaged PMD transmitter since the signaling rate range is a superset of existing requirements**

**The co-packaged PMA output cannot meet the ±50 ppm limit when the PMD receives a ±100 ppm input**



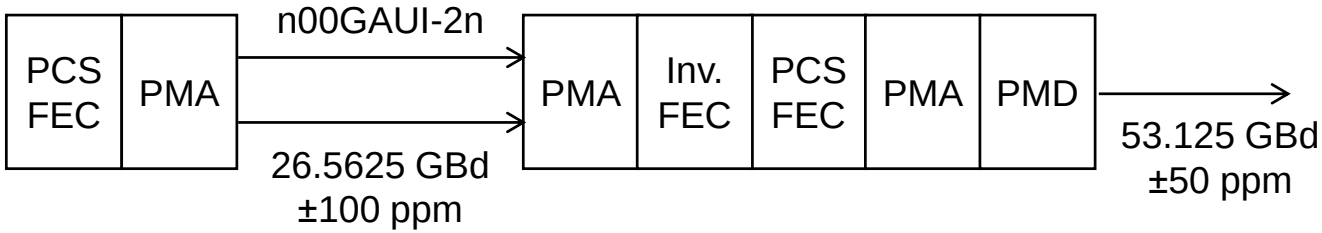
# Migration considerations




**Consider addition of a gearbox to adapt a wider "legacy" interface to a new narrower interface or PHY**

**Tighter signaling range for new interface or PHY implies the frequency reference for original interface must also be updated**

**Extender sublayer (or inverse FEC) presents opportunity to reconcile clock frequencies**



# Proposal

- Propose to tighten signaling rate range to ±50 ppm to exploit favorable cost-benefit trade-off
- Specification for chip-to-module interface must account for the fact that signaling rate range for the module output is set by the link partner
- Leave module output and host input signaling rate ranges unchanged but consider adding a note to explain why
- Set host output and module input signaling rate ranges to ±50 ppm to encourage transition to higher precision references over time (there is no impact on PMD compliance)
- Change all other signaling rate ranges to ±50 ppm