

# In support of response to comment #52

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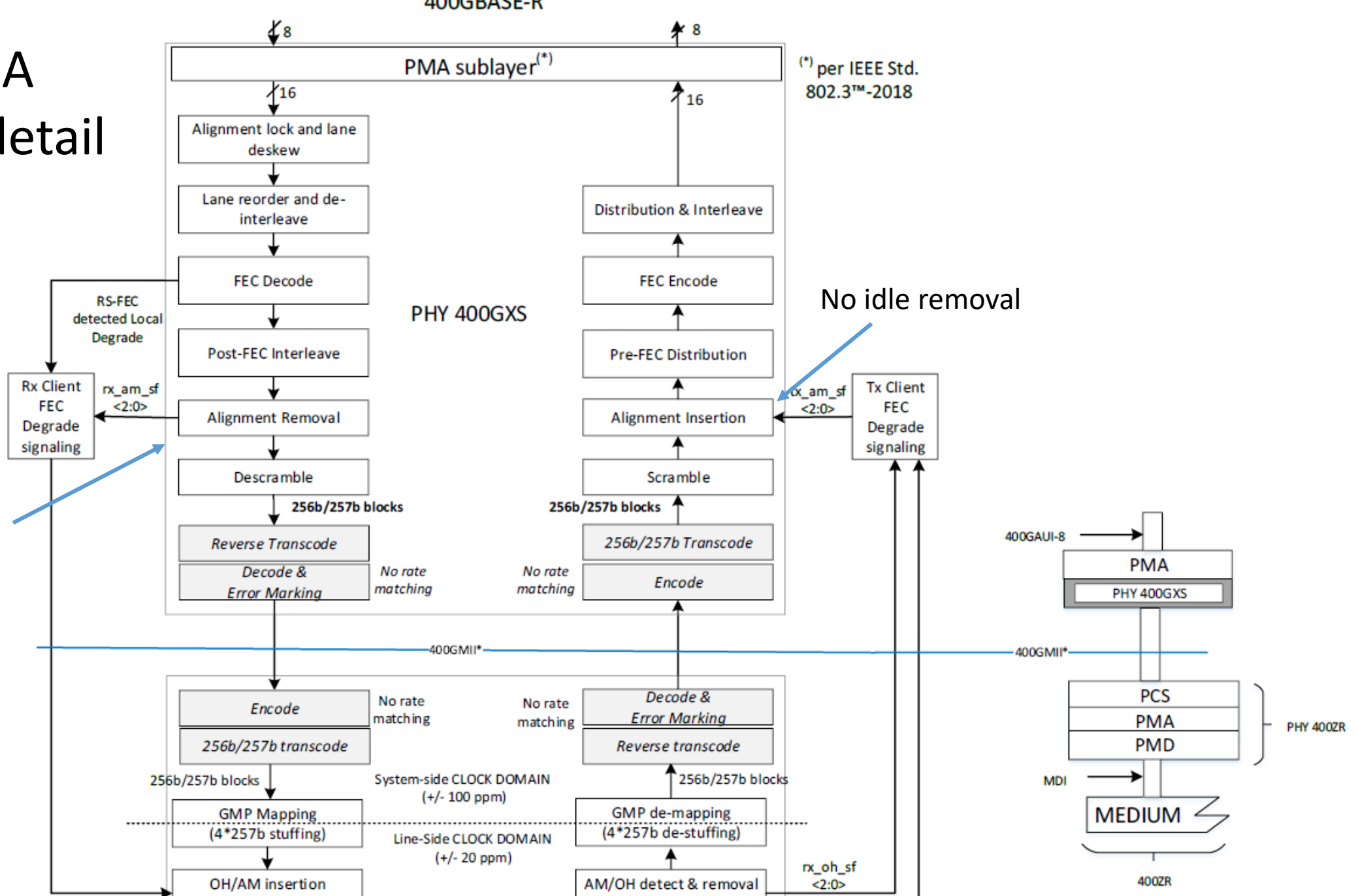
# Comment #52 – From Adee Ran

- Comment
  - "at a rate of 401.542892 Gb/s  $\pm$  100 ppm."
  - Even assuming the 257B/256B transcoder output (which has the lowest data rate), the nominal rate is  $400 * 257 / 256 = 401.5625$  Gb/s, higher than the number given.
  - Also, where does the 100 ppm come from? nothing in the PCS requires this range, and neither of the 400GMII, 400GBASE-R PCS, and 400GBASE-R PMA has a frequency range specification. The 100 ppm is only specified for the 400GAUI-n which could be part of the Extender, but it's not part of the PHY and doesn't necessarily exist. The 400GMII is only "specified to support 400 Gb/s operation" in 117.1.3 - without a range.
- Suggested remedy:
  - Change "401.542892 Gb/s  $\pm$  100 ppm" to "401.5625 Gb/s. The actual rate results from the 400GMII data rate, which may be within  $\pm 100$  ppm of the nominal rate if a 400GMII Extender is used".
  - ("nominal" should be inserted by the previous comment).

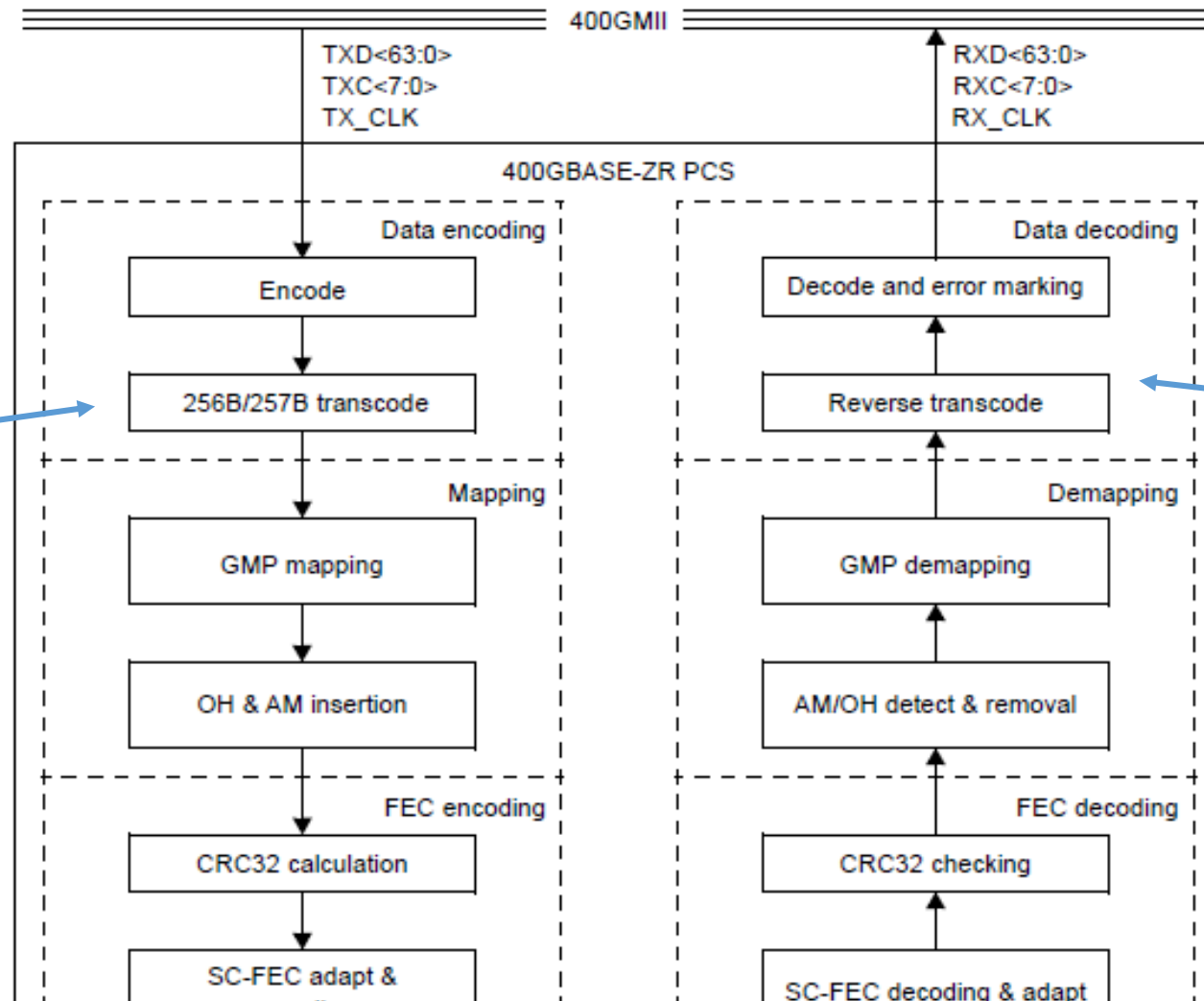
# Signal rate

- OIF 400ZR IA: Module with a 400GAUI-8 Interface
  - 400GAUI-8 rate: 425 Gb/s
  - Remove RS(514, 544) FEC:  $425 \times 514/544$  Gb/s
  - Remove PCSL AMs:  $425 \times 514/544 \times 163832/163840 = \sim 401.542892$  Gb/s
  - Note: AMs are removed without idle compensation
- 802.3cw: No 400GAUI-8
  - PCS rate: 400 Gb/s
  - 257B/256B Encoding:  $400 \times 257/256 = 401.5625$  Gb/s
  - No PCSL AMs added/removed
- The rate difference is  $\sim 49$  ppm

# OIF 400ZR IA Data path detail



# 400GBASE-ZR PCS functional block diagram

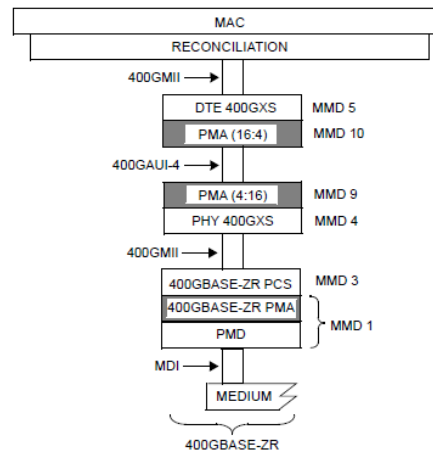


No idle removal to make room for AMs

No idle insertion to account for AMs

# 400ZR – 400GBASE-ZR Interoperability: Option 1

- 400ZR signal rate: 401.542892 Gb/s, 400GBASE-ZR signal rate: 401.5625 Gb/s
- 400ZR side 400GAUI-8 PCS to PHY 400GXS transmit clock generation:
  - Recover clock from GMP payload (401.542892 Gb/s)
  - Multiply it by  $544/514 \times 163840/163832$  to get the 425 Gb/s 400GAUI-8 rate
  - If the peer is a 400GBASE-ZR the result will be +49 ppm off
- In the 400GBASE-ZR side (receiving a signal from a 400ZR interface) there is no clock recovery at the receive side
  - If a 400GMII extender is used, then the 400GAUI-4 rate may be off by -49 ppm



# 400ZR – 400GBASE-ZR Interoperability: Option 2

- 400ZR signal rate = 400GBASE-ZR signal rate = 401.542892 Gb/s
- No interoperability issue
- How do we define the signal time base ?
- How do we handle the 400GMII extender option ?
- Proposal:
  - In the transmit direction use a 401.5625 Gb/s rate and remove idles with a ratio of 163832/163840 before mapping to GMP payload
  - In the receive direction add idles with the inverse ratio

# Conclusion

- We need to fix the signal rate
- Proposal: Select option 2
- Comment resolution:
- **Accept in principle.**
  - Change: The 257-bit encoded data is a logically serial stream at a rate of  $401.542892 \text{ Gb/s} \pm 100 \text{ ppm}$ . The Payload area of the 400GBASE-ZR frame has a capacity of  $402.489753 \text{ Gb/s} \pm 20 \text{ ppm}$ .
  - To: The 257-bit encoded data is a logically serial stream at a rate of  $401.5625 \text{ Gb/s} \pm 100 \text{ ppm}$ . Idle blocks are removed from the 257-bit encoded data at a rate of  $163832/163840$  before the 257-bit encoded data is mapped to the payload area of the 400GBASE-ZR frame. The payload area of the 400GBASE-ZR frame has a capacity of  $402.489753 \text{ Gb/s} \pm 20 \text{ ppm}$ .
  - Add to the end of clause 155.2.6.8 GMP de-mapping: Idle blocks are added to the 257-bit encoded data at a rate of  $163832/163840$ .