

Modulation format for 802.3dg

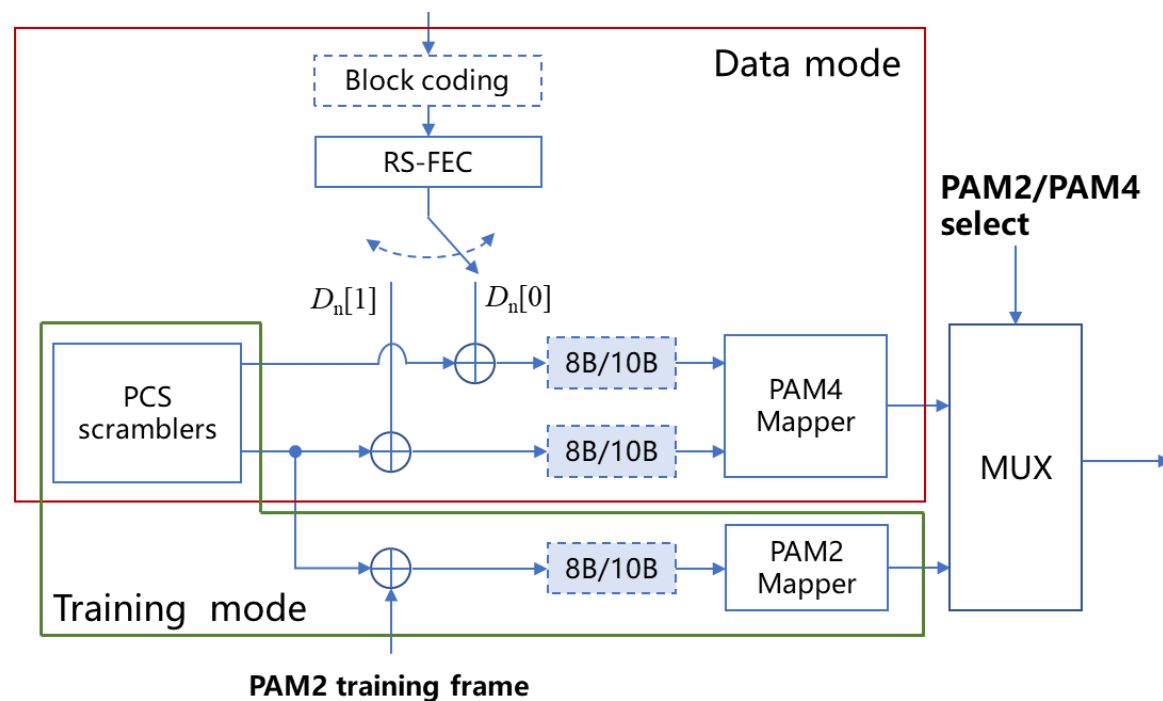
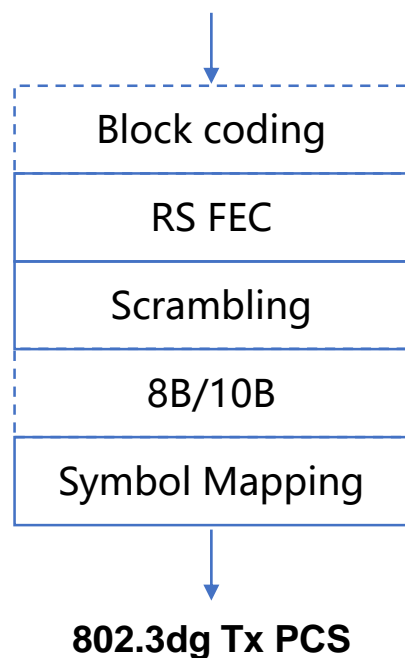
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PAM candidates

- Series of SNR analysis have shown that PAM3, PAM4, and PAM5 achieve similar SNR margin.
 - [zimmerman 3dg 01a 03 15 2023](#)
 - [Tingting 3dg 02 13 09 2023](#)
 - [Tingting 3dg 01 25 10 2023](#)
 - ...
- All PAMs realize bounded disparity using specific coding. Among these, PAM3 requires higher-order LPF and more complicated FEC to effectively mitigate the EFT and ringing impact.
- 8B4T PAM5 achieves smaller signal bandwidth than 8B/10B PAM4. To ensure fast convergence and bounded disparity during PMA training, block coded PAM2 is required.
 - The efficiency of PMA training may be impacted due to different spectrum generated from the block coding.
 - The PCS complexity is also increased. For example, different scramblers (indicating different clocks) have to be used, and the seed of the data-mode scrambler needs to be transmitted during training.
- PAM4 has been widely used in BASE-T1 standards. With 8B/10B coding, it achieves bounded disparity and allows most PCS functions shared between data and training mode.
 - 8B/10B may be bypassed for non-intrinsic-safety application.

PCS architecture

- The PCS architecture for 802.3dg can refer to that for automotive SPE. The difference is 8B/10B before symbol mapping to achieve bounded disparity for intrinsic safety application.
- As discussed in [Tingting 3dg 01 25 10 2023](#), there are many FEC options with <10% overhead and no interleaving. The clock frequencies are also achievable.



Conclusion

- Considering coding efficiency, SNR margin, PCS complexity, PMA training efficiency and the ecosystem, PAM4 can be a good choice for 802.3dg.

Thank you!