PAM-4 for RD53 High-Speed Data Link

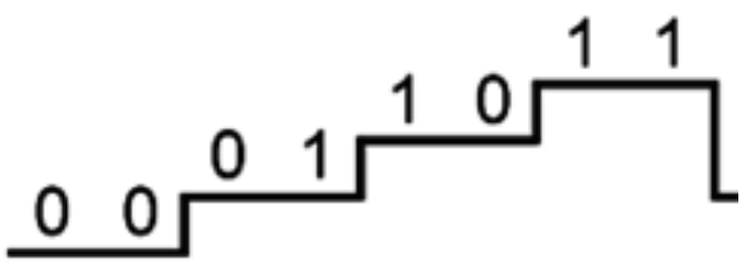
Veronica Wallangen

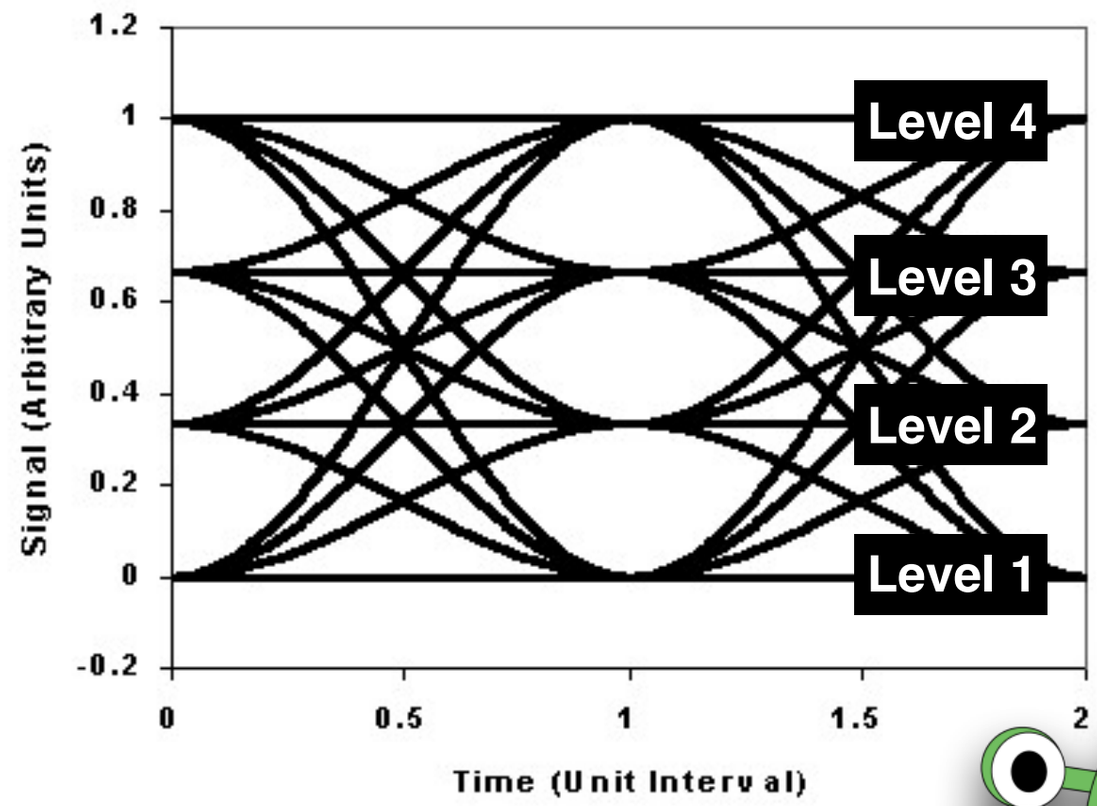
December 2 2016

PAM-4

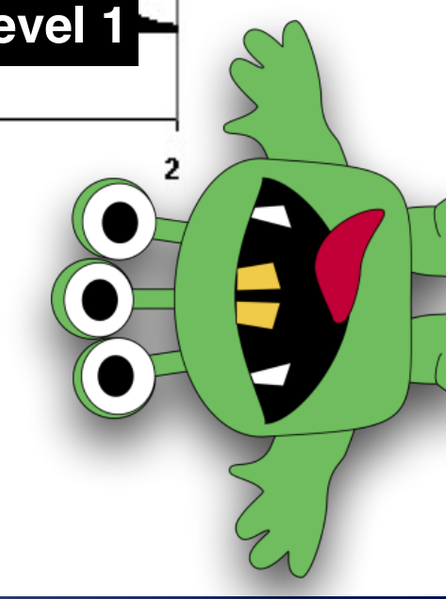
ATLAS Phase-II Pixel Cables: low mass, <u>small bandwidth</u>

PAM-4: 4-level Pulse Amplitude Modulation
Cuts bandwidth for given data rate in half by transmitting two bits in each symbol



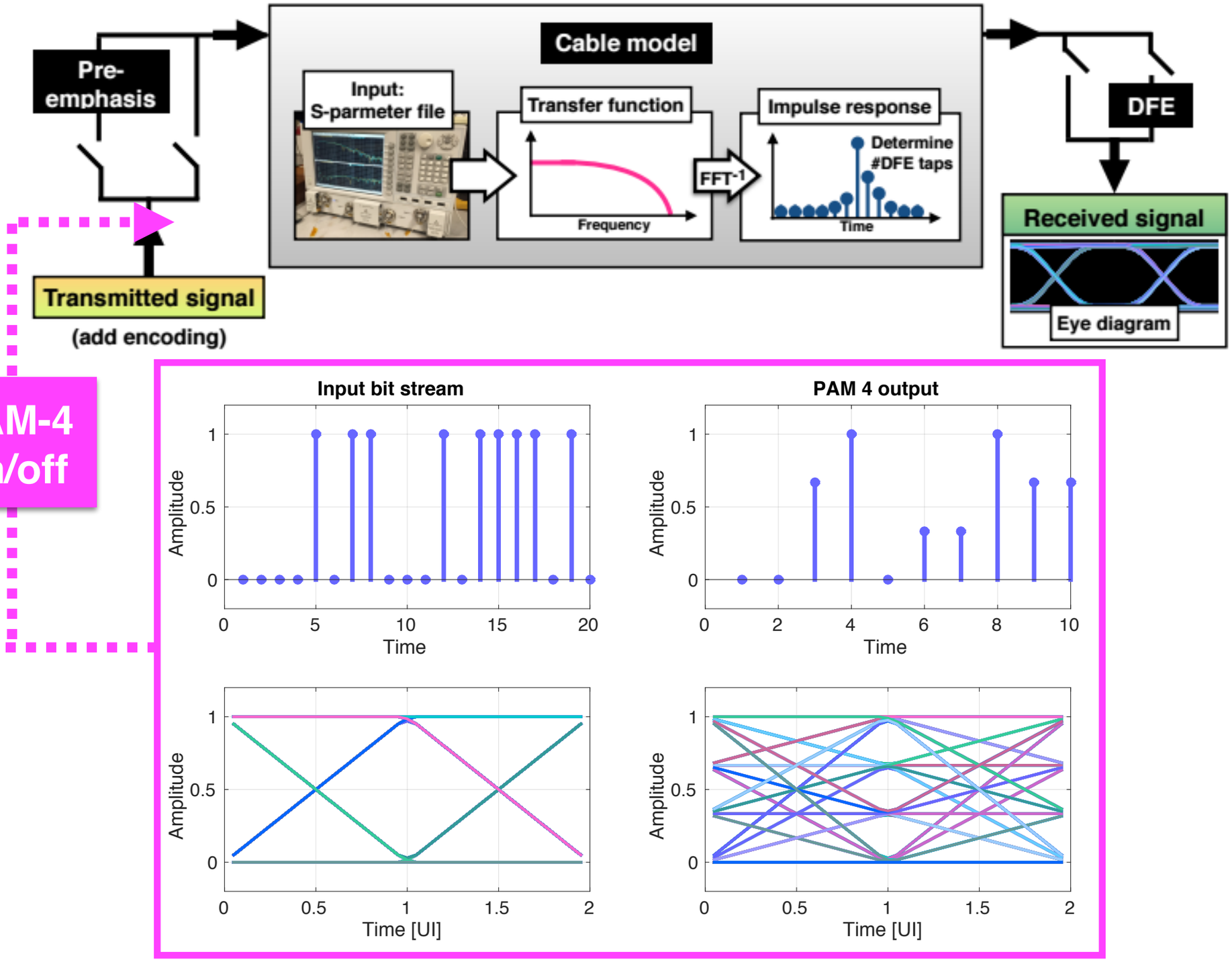


2 bits encoded by each pulse amplitude level



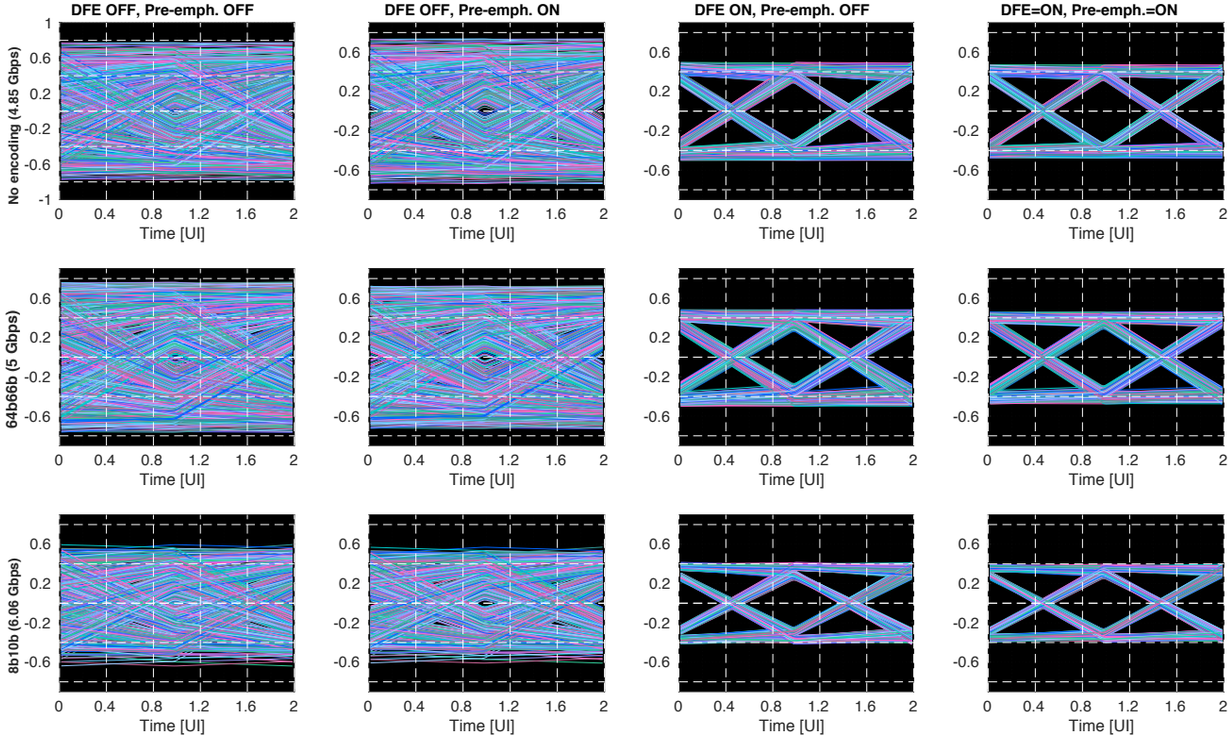
PAM-4 Implementation

PAM-4 encoder implemented in link simulation tool

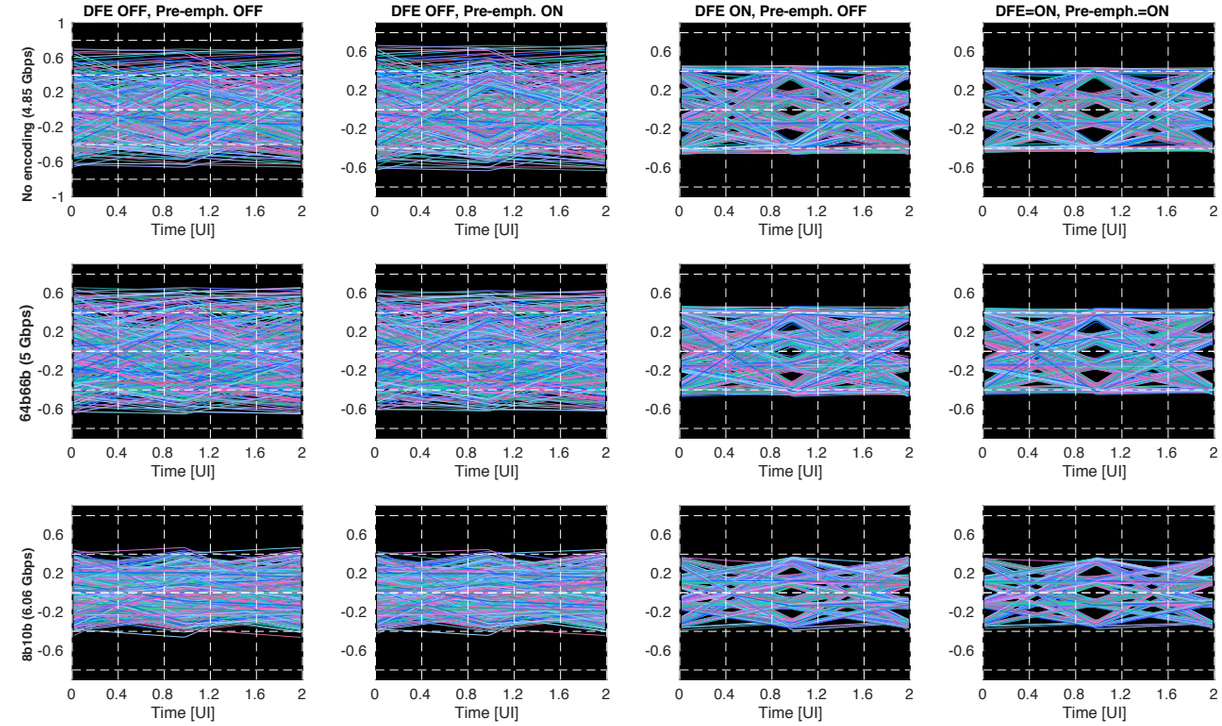


PAM-4 Data on ATAS Phase-II Pixel Cables

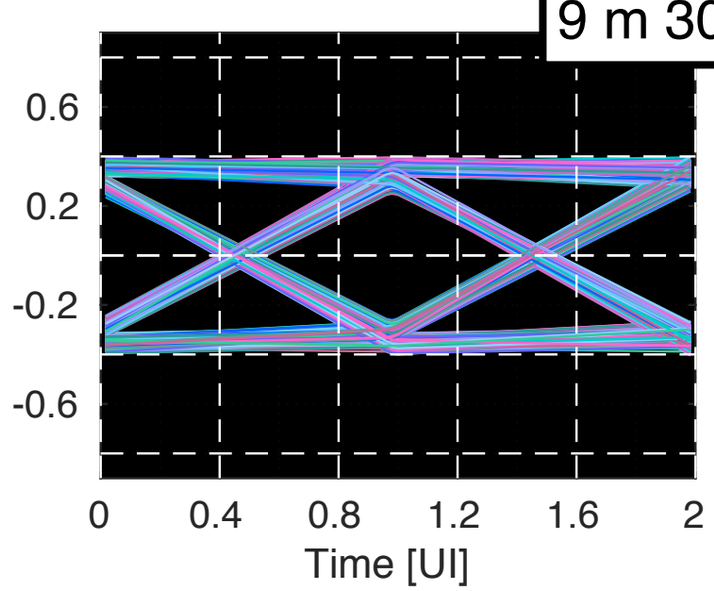
w/o PAM-4

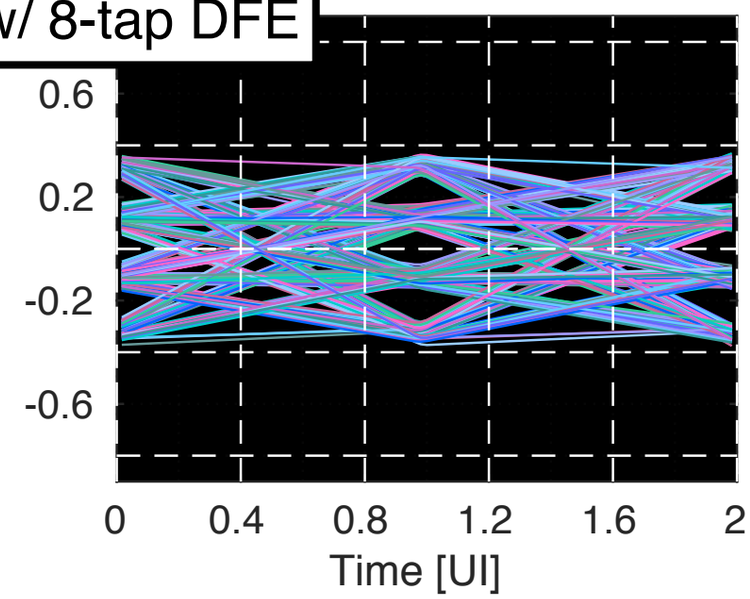


w/ PAM-4

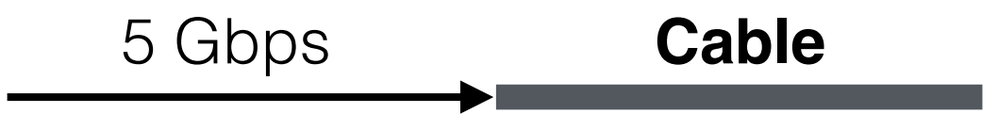


9 m 30 AWG twinax cable w/ 8-tap DFE

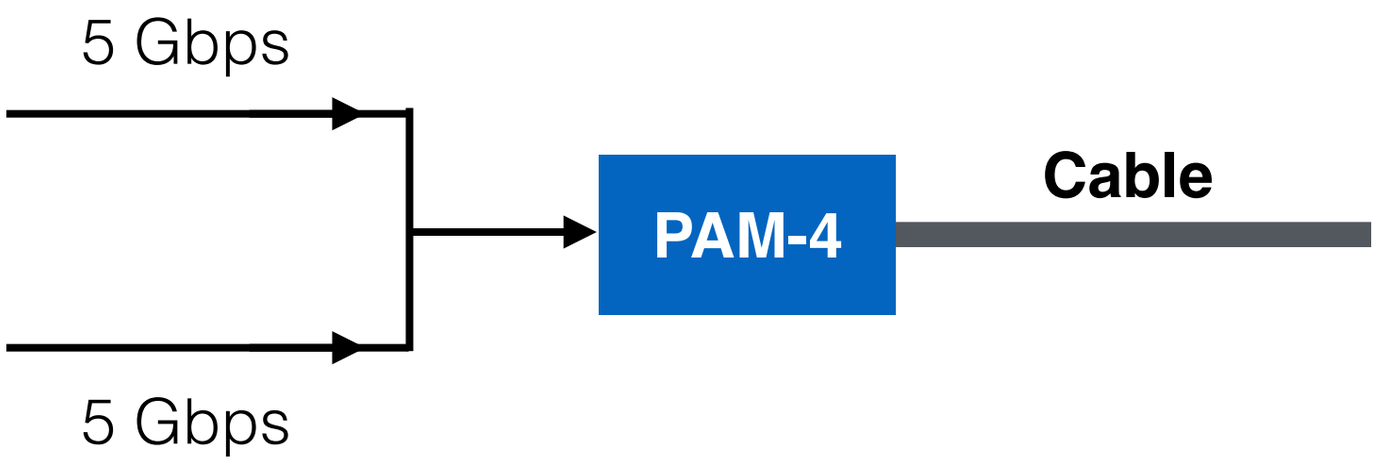




PAM-4 Application



PAM-4 enables doubling the data rate for transmission over cable with certain bandwidth



Requires sufficient SNR!