R_LM AND SNDR MEASUREMENT PROPOSAL

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MOTIVATION TO CHANGE RLM & SNDR DEFINITION

- Current R_{LM} specification is based on the minimum eye opening between the 4 PAM levels
- Current spec allows large deviations from ideal levels (up to 20% in asymmetric case)
  - COM models the reduction in ideal eye opening implied by R_{LM}, but assumes perfect ISI cancellation by DFE
  - It is not practical for a DFE to achieve this when TX levels are distorted
  - Margin impact is proportional to the max. error on ES1 and ES2 and DFE tap weights
  - Need to constrain the maximum error on ES1 and ES2 to avoid the worst case effect
- R_{LM} spec allows larger deviation (+10%) on the positive side of ES1 and ES2
  - In addition to DFE's imperfect ISI cancellation, this case is further aggravated by RX circuit compression
  - Even with perfect linearity in the RX, PAM4 outer eyes are already more distorted.

ORIGINAL PROPOSAL

- Assuming perfect data levels (-1,-1/3, 1/3,1), use the existing method to obtain the linear fit pulse p(t)
- With this p(t), the input symbol matrix X, and the TX output Y, use least squares fit to obtain the 4 levels L_A, L_B, L_C, and L_D (details of the method described in valliappan_02_122115_elect.pdf)
- Compute:
  - $L_{mid} = (L_D+L_A)/2$, $ES1 = (L_B - L_{mid})/(L_A - L_{mid})$, $ES2 = (L_c - L_{mid})/(L_D - L_{mid})$
- R_{LM} defined to capture maximum deviation from ideal
  - R_{LM} = Min(3*ES1, 3*ES2, 2-3*ES1, 2-3*ES2) with limit of 0.95
  - This will allow ES1 and ES2 to assume values of +/- 5% around ideal value of 1/3
- Define ES = (ES1 + ES2)/2
- Re-compute p(t) and SNDR using the source TX levels as [-1, -ES,+ES,+1]

UPDATED PROPOSAL

Replace the first 2 steps in the previous page with the direct measurement step proposed by A. Healey

- Measure the signal levels L_A, L_B, L_C, and L_D directly using PRBS13Q per Healey's comment
- Compute:
  - $L_{mid} = (L_D+L_A)/2$, $ES1 = (L_B - L_{mid})/(L_A – L_{mid})$, $ES2 = (L_c - L_{mid})/(L_D – L_{mid})$
- R_{LM} defined to capture maximum deviation from ideal
  - R_{LM} = Min(3*ES1, 3*ES2, 2-3*ES1, 2-3*ES2) with limit of 0.95
  - This will allow ES1 and ES2 to assume values of +/- 5% around ideal value of 1/3
- Define ES = (ES1 + ES2)/2
- Compute p(t) (linear fit) and SNDR using the source TX levels as [-1, -ES,+ES,+1]