MLSE ΔCOM Equation U1.c Rewritten in 802.3 Standard DER Definition

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Introduction

- In the January 2024 Interim meeting, equation U1.c was adopted by 802.3dj to calculate the delta COM due to MLSE effect in the COM reference receiver:

$$\Delta COM \approx 20\log_{10}\left(\frac{1}{A_s}CDF_{noise}^{-1}\left(1-\frac{2}{3}DER_{MLSE}\right)\right) - IP$$

$$DER_{MLSE} \approx 2\sum_{j=1}^{\infty}\left(\frac{3}{4}\right)^{j}\left(1 - CDF_{noise,jEE}\left(A_s\frac{\left(\mathrm{trace}\left(\rho_{noise,jEE}\right)\right)^{\frac{3}{2}}}{\sqrt{\sum_{vertical}\sum_{horizental}\left(\rho_{noise,jEE}\right)}}\right)\right)$$

Equation U1.c

- In the equation above, DER_{MLSE} meant the probability of the initial symbol error event caused by MLSE

Suggestion (1/2)

- However, the term “DER” is a reserved term in the 802.3 standard, which is specified in clause 93A.1.7
  - Incorrect DER_0 formula is found in the current published specification, and it must be corrected to $1\text{-}P(y_0)=DER_0$

$$P(y) = \int_{-\infty}^{y} p(y)dy \qquad (93A\text{–}37)$$

The noise amplitude, A_{ni}, is the magnitude of the value of y_0 that satisfies the relationship $P(y_0) = DER_0$ where DER_0 is the target detector error ratio. The detector error ratio is the probability that the detector fails to identify the signal level that was transmitted.

Suggestion (2/2)

- The ΔCOM equation U1.c is to be rewritten as follows with the “DER” definition being consistent with the 802.3 standard description in clause 93A.1.7

$$\Delta COM \approx 20 \log_{10}\left(\frac{1}{A_s} CDF_{noise}^{-1}(1 - DER_{MLSE})\right) - IP$$

$$DER_{MLSE} \approx \sum_{j=1}^{\infty}\left(\frac{3}{4}\right)^{j-1}\left(1 - CDF_{noise,jEE}\left(A_s \frac{\left(trace\left(\rho_{noise,jEE}\right)\right)^{\frac{3}{2}}}{\sqrt{\sum_{vertical}\sum_{horizontal}\left(\rho_{noise,jEE}\right)}}\right)\right)$$

} Rewritten Equation U1.c

- Note that the ΔCOM results do not change by the rewritten equation

Thank You!