COM 4.0 Update: COM Post Processing for Receivers which Utilize a Maximum Likelihood Sequence Estimate (MLSE)

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# COM Code Operation and MLSE Invocation

❑ Keywords in the COM configuration spreadsheet are used to invoke features and specify computational parameters.
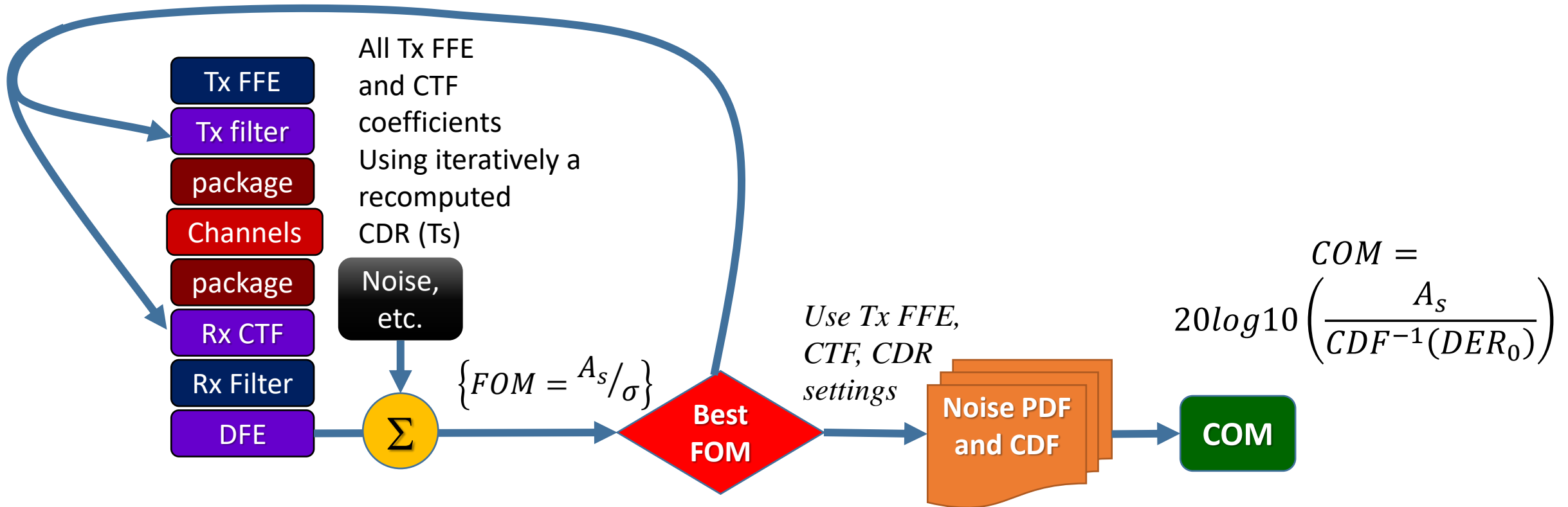
❑ MLSE is invoked with the MSLE keyword

Parameter	Setting	Units
MLSE	1	logical

❑ MLSE is not invoked if the keyword is missing or set to 0

❑ Related parameters
  • DER_0 (detector error ratio)
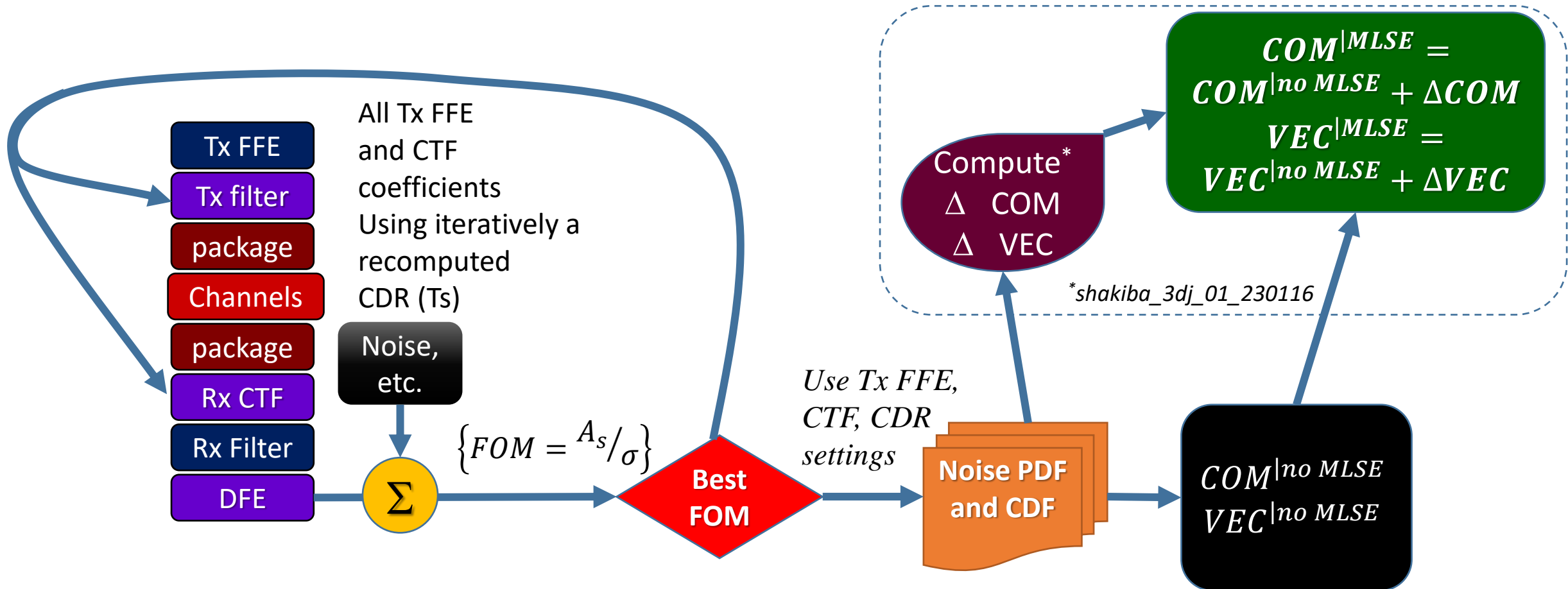 • b_max(1) (maximum normalize DFE1 value)
  • N_b (number of DFE taps)

Channel Operating Margin
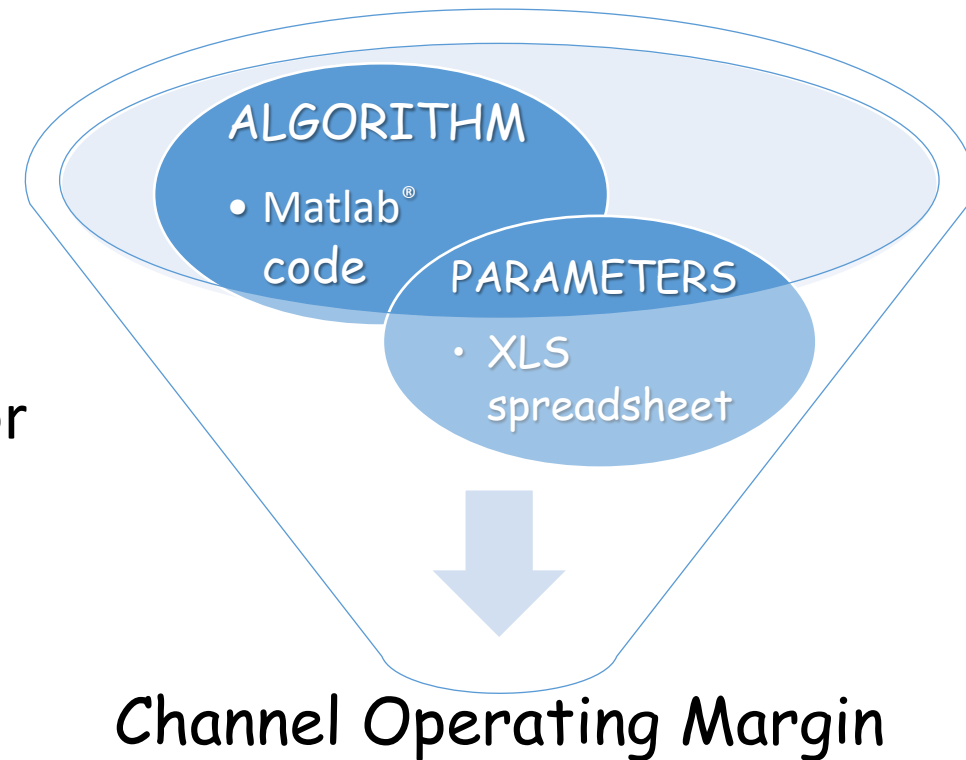
*https://www.ieee802.org/3/dj/public/23_01/23_0116/shakiba_3dj_01_230116.pdf

IEEE P802.3df 200 Gb/s, 400 Gb/s, 800 Gb/s, and 1.6 Tb/s Ethernet Task Force

Simplified COM Algorithm Overview

All Tx FFE and CTF coefficients Using iteratively a recomputed CDR (Ts)

Tx FFE

Tx filter

package

Channels

package

Rx CTF

Rx Filter

DFE

Noise, etc.

Σ

$\left\{FOM = {}^{A_s}/_{\sigma}\right\}$

Best FOM

Use Tx FFE, CTF, CDR settings

Noise PDF and CDF

COM

$$COM = 20log10\left(\frac{A_s}{CDF^{-1}(DER_0)}\right)$$

IEEE P802.3df 200 Gb/s, 400 Gb/s, 800 Gb/s, and 1.6 Tb/s Ethernet Task Force

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COM Algorithm with MLSE Post-processing

All Tx FFE and CTF coefficients Using iteratively a recomputed CDR (Ts)

Tx FFE
Tx filter
package
Channels
package
Rx CTF
Rx Filter
DFE

Noise, etc.

Σ

$\left\{FOM = A_s/\sigma\right\}$

Best FOM

Use Tx FFE, CTF, CDR settings

Noise PDF and CDF

Compute* Δ COM Δ VEC

*shakiba_3dj_01_230116

$COM^{|no\ MLSE}$
$VEC^{|no\ MLSE}$

$COM^{|MLSE} = COM^{|no\ MLSE} + \Delta COM$
$VEC^{|MLSE} = VEC^{|no\ MLSE} + \Delta VEC$

IEEE P802.3dj Ethernet Task Force

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COM MLSE Caveats

❑ As previously noted, MLSE is basically a post processing for COM computations
- Equalizer and CDR optimization are performed pre-MLSE

❑ MLSE adjustment will not occur if there is more noise than signal
- A warning is reported

❑ Displayed bathtub curves and eye diagram figures are computed without MLSE

❑ EH is not adjusted for MLSE

❑ When $b_{max}(1)$ is 1 or slightly less, best improvement from MLSE could be expected.

❑ The ΔSNR computation is independent of whether Rx FFE, Rx DFE, or RX DFE floating taps are specified. At least one tap of DFE is required.

❑ Spreadsheets are not part of the COM 4.0 zip file

Summary of D4.0 Update

❑ New capability: MLSE processing capability added to COM computation

❑ Better linkage in between reports figures and circuit diagram

❑ "Die to die" loss explicitly reported

Thank You!