

Commit requests for COM 4.5

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IEEE P802.3dj COM ad hoc

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Summary of commit requests

- [4p4_5] Correct errors in function MMSE_FOM()
- [4p4_6] Indexing error in function get_PSDs()
- [4p4_7] Sampling time search does not minimize mean-squared error
- [4p4_8] Incorrect value of sigma_N assigned in function Create_Noise_PDF()

Commit request 4p4_6

- In function get_PSDs(), sampling_offset is 0 when cursor_i is an integer multiple of M.
- This results in the subsequent line throwing an error when OP.COMPUTE_COM is true.

Proposed changes to get_PSDs()

```
164 %% Hisi to be included in MLSE rho eq 178a-28
165 if OP.COMPUTE_COM
166     %% Hisi psd h include CTLE(CFT), TxFFE, and RxFFE but not sigma_X2
167     sampling_offset = mod(cursor_i-1, M)+1;
168     hisi=h(sampling_offset:M:end);
169     hisi=hisi(:)';
170     if num ui>length(hisi)
```

get_PSDs() in COM 4.4

```
. %% Hisi to be included in MLSE rho eq 178a-28
. if OP.COMPUTE_COM
.     %% Hisi psd h include CTLE(CFT), TxFFE, and RxFFE but not sigma_X2
x sampling_offset = mod(cursor_i, M);
. hisi=h(sampling_offset:M:end);
. hisi=hisi(:)';
. if num ui>length(hisi)
```

Commit request 4p4_7

- In function `optimize_fom()`, the sampling time search is hard-coded to "middle_search".
- The "middle_search" algorithm is not guaranteed to find the sampling time that minimizes mean-squared error (or maximizes FOM) as prescribed in Annex 178A (especially when the RX-FFE coefficients are subject to constraints).
- The sampling time search method cannot be changed without editing the function.
- A "full sweep" option should be added to for the sampling time search and it should be made the default search algorithm.

Proposed changes to `optimize_fom()`

```

593 best_cluster=[];
594
595 %box_search: take the middle of 5 point windows, then use the best of those to search the rest of t
596 %middle_search: start from itick=0 and work outwards in negative and positive direction. stop searc
597 % box_search=0;
598 % middle_search=1;% should set 0 so all Ts sample points are used
599 switch lower(OP.TS_SRCH_MODE)
600     case 'full-sweep'
601         box_search = 0;
602         middle_search = 0;
603     case 'middle'
604         box_search = 0;
605         middle_search = 1;
606     otherwise
607         error('Unsupported TS_SRCH_MODE (%s)!', OP.TS_SRCH_MODE);
608 end
609
610 if box_search
611     box_size=5;

```

`optimize_fom()` in COM 4.4

```

593 best_cluster=[];
594
595 %box_search: take the middle of 5 point windows, then use the best of those to search the rest of t
596 %middle_search: start from itick=0 and work outwards in negative and positive direction. stop searc
597 box_search=0;
598 middle_search=1;% should set 0 so all Ts sample points are used
599
600
601
602
603
604
605
606
607
608
609
610 if box_search
611     box_size=5;

```

Commit request 4p4_7 continued

Proposed changes to read_ParamConfigFile()

```

529 OP.Do_Colored_Noise= xls_parameter(parameter, 'Do_Colored_Noise', false, 1);
530 OP.Do_White_Noise=xls_parameter(parameter, 'Do_White_Noise', false, 0);
531 OP.FFE_OPT_METHOD=xls_parameter(parameter, 'FFE_OPT_METHOD', false, 'MMSE'); % 'MMSE', 'FV-LMS', 'WIENER-HOPF',
532 OP.TS_SRCH_MODE = xls_parameter(parameter, 'TS_SRCH_MODE', false, 'full-sweep');
533

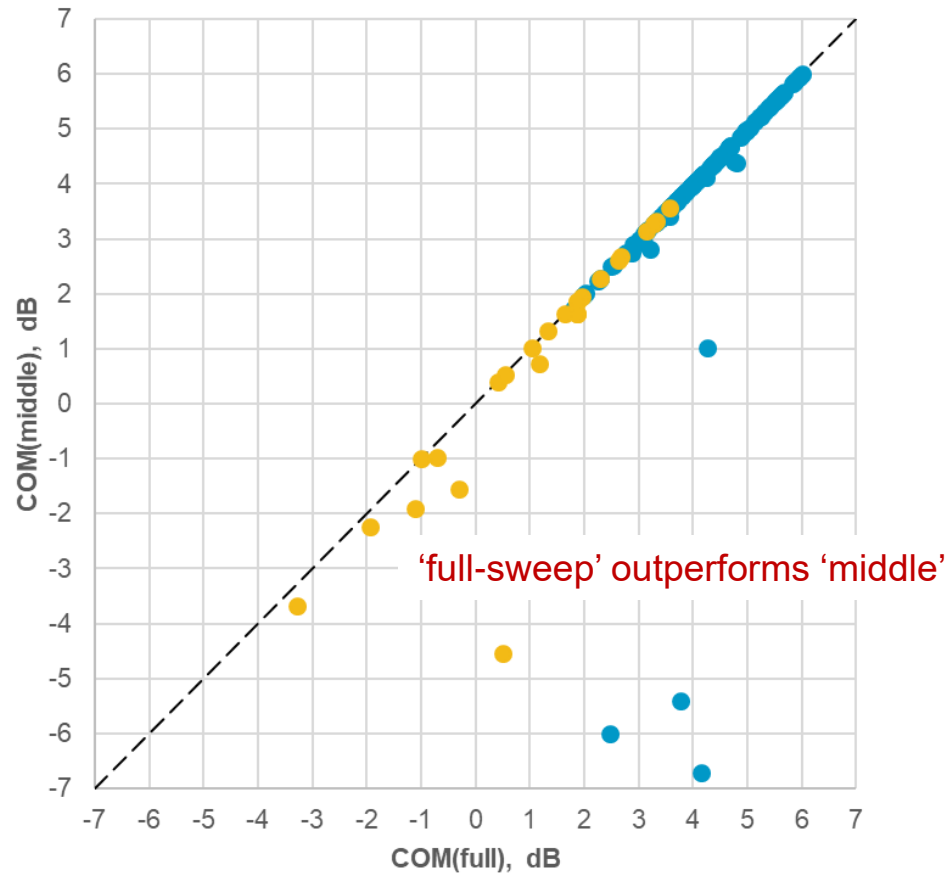
```

read_ParamConfigFile() in COM 4.4

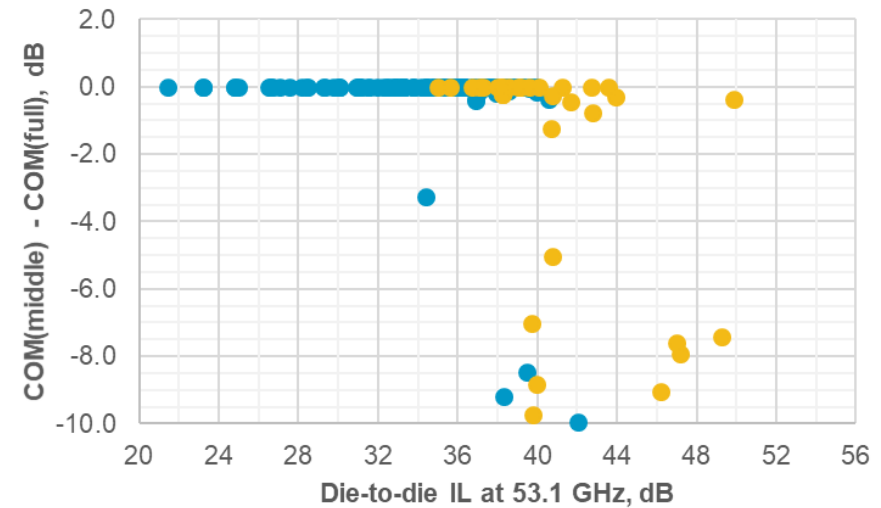
```

529 OP.Do_Colored_Noise= xls_parameter(parameter, 'Do_Colored_Noise', false, 1);
530 OP.Do_White_Noise=xls_parameter(parameter, 'Do_White_Noise', false, 0);
531 OP.FFE_OPT_METHOD=xls_parameter(parameter, 'FFE_OPT_METHOD', false, 'MMSE'); % 'MMSE', 'FV-LMS', 'WIENER-HOPF',
532 OP.FFE_OPT_METHOD=xls_parameter(parameter, 'FFE_OPT_METHOD', false, 'MMSE'); % 'MMSE', 'FV-LMS', 'WIENER-HOPF',
533

```



- Comparison of TS_SRCH_MODE = 'middle' to 'full-sweep'
- Test cases defined in [healey 3dj 01 2401](#)
- Based on COM 4.5beta1 with commit requests 4p4_5 through 4p4_8



Commit request 4p4_8

- In function Create_Noise_PDF(), sigma_N is assigned the value in structure “fom_result”.
- This value does not include filtering by the RX-FFE, even though all other results from Create_Noise_PDF() are at the output of the RX-FFE when OP.FFE_OPT_METHOD = 'MMSE'.

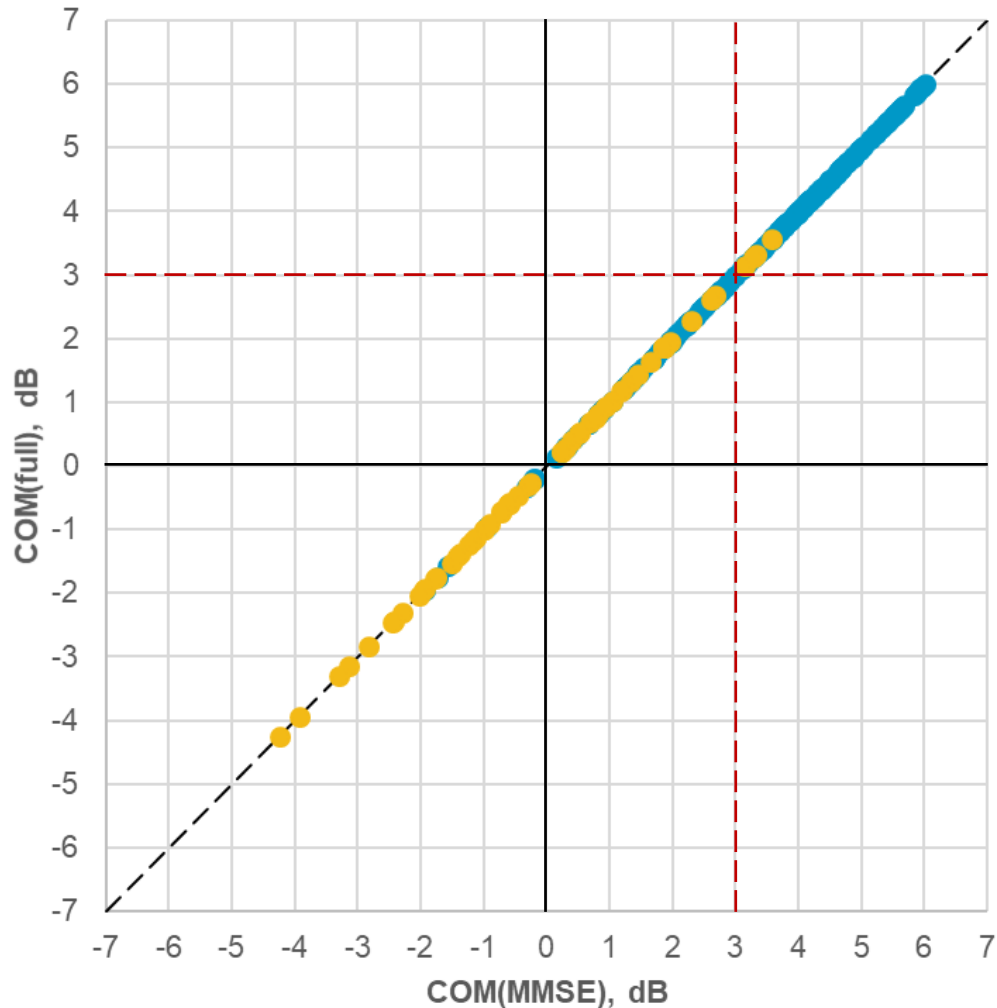
Proposed changes to Create_Noise_PDF()

```
35 else
36   NS.sigma_TX =PSD_results.S_tn_rms;
37   NS.sigma_G = PSD_results.S_G_rms;
38   NS.sigma_rjit=PSD_results.S_rj_rms ;
39   NS.sigma_N = PSD_results.S_rn_rms;
40 end
41 % Equation 93A-41 %%
```

Create_Noise_PDF() in COM 4.4

```
. else
.   NS.sigma_TX =PSD_results.S_tn_rms;
.   NS.sigma_G = PSD_results.S_G_rms;
x   NS.sigma_rjit=PSD_results.S_rj_rms ;
.
. end
. % Equation 93A-41 %%
```

Comparison of results to [healey_3dj_01_2401](#)



- COM(MMSE) corresponds to the results on slide 19 of [healey_3dj_01_2401](#)
- COM(full) corresponds to results from COM 4.5beta1 with commit requests 4p4_[5, ..., 8]
- TS_SRCH_MODE = 'full-sweep'
- Good correlation (no MLSE, no floating taps)

