# A Study on 200G/Lane electrical interface parameters

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# Abstract


- Jitter and transition time is a trade off between performance and implementation power and cost. Jitter and transition time linearly scaled down from 100G/lane is challenging for massive 200G/lane productions given power and cost constraints.

- ran_3dj_elec_01a_231207 proposed to move the standard forward with some preliminary parameters. We investigated how to optimize $\sigma_{RJ}$, $A_{DD}$, and Tr for broad implementation and reasonable performance.

# Initial simulation conditions

- COM parameters (detail COM parameters in back up)
  - fb : 106.25 GBaud
  - Tx FIR : pre 2 taps, post 0 taps
  - Rx FFE : pre 6 taps, post 45 taps
  - DFE : 1 tap
  - No floating taps
  - $DER_0$ : 1E-4
  - $\eta_0$ : 4.0E-9
  - Tr : 4ps
  - $\sigma_{RJ}$ : 10mUI
  - $A_{DD}$ : 20mUI
  - Package A (case 2: zp=33mm)
    - ✓ Without MLSE
  - Package B (case 4: zp=45mm)
    - ✓ With MLSE

# KR/CR Channels used for the study

- Selected 26 KR/CR channels from contribution to P802.3dj
  - For each data set, selected a few channels with die2die IL ≤ 40dB
    - ✓ If possible, selected with PKG B
    - ✓ If not possible with PKG B, selected with PKG A
  - With PKG A, all channels have die2die IL ≤ 40dB
    - ✓ All 26 channels are used for study with PKG A
  - With PKG B, only channels 1-9,12,16 have die2die IL ≤ 40dB
    - ✓ Only those 11 channels are used for study with PKG B

| | | | CH IL | Fit CH IL | D2D IL | D2D IL | ILD | ERL | ICN | COM (dB) w/ PKG A | | COM (dB) w/ PKG B | | used for study | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CH# | data set | tag | (dB) | (dB) | PKGA(dB) | PKGB(dB) | (dB) | (dB) | (mV) | w/ MLSE | w/o MLSE | w/ MLSE | w/o MLSE | w/ PKG A | w/ PKG B |
| 1 | mellitz_3dj_02_elec_230504 | CA 200mm, FO 100mm, PCB 75mm | 22.7638 | 21.5792 | 32.7456 | 39.4515 | 0.20705 | 18.6363 | 0.94363 | 5.1718 | 4.1102 | 4.9269 | 2.9748 | x | x |
| 2 | | CA 200mm, FO 200mm, PCB 50mm | 22.3229 | 21.3837 | 32.9123 | 39.2556 | 0.21796 | 17.9239 | 0.93516 | 4.9469 | 3.8088 | 4.2941 | 2.3837 | x | x |
| 3 | | CA 500mm, FO 100mm, PCB 50mm | 22.2536 | 20.9543 | 32.9592 | 39.2247 | 0.22056 | 17.7278 | 0.97363 | 4.9214 | 3.7906 | 4.3284 | 2.4181 | x | x |
| 4 | | CA 1000mm, FO 100mm, PCB 25mm | 21.8556 | 21.7501 | 33.0429 | 39.2081 | 0.22531 | 16.7368 | 0.8868 | 6.3565 | 5.0673 | 5.5984 | 3.5566 | x | x |
| 5 | weaver_3dj_02_2305 | host1 150mm, host2 150mm | 21.7407 | 22.0272 | 33.0356 | 39.1232 | 0.095847 | 17.1272 | 1.2286 | 4.9157 | 3.7017 | 4.2864 | 2.2928 | x | x |
| 6 | | host1 150mm, host2 200mm | 22.302 | 22.5379 | 33.4566 | 39.6155 | 0.088222 | 17.1397 | 1.2241 | 5.1304 | 3.6487 | 4.1698 | 2.1693 | x | x |
| 7 | | host1 150mm, host2 250mm | 22.9027 | 23.0468 | 34.1459 | 40.249 | 0.08713 | 17.1585 | 1.2199 | 4.7737 | 3.4397 | 3.9583 | 1.9165 | x | x |
| 8 | akinwale_3dj_01_2310 | External 100mm | 20.8348 | 20.5607 | 30.4362 | 37.305 | 0.13515 | 15.6556 | 1.127 | 5.9554 | 4.5797 | 5.329 | 3.2735 | x | x |
| 9 | | External 300mm | 22.361 | 22.2294 | 31.9688 | 38.8317 | 0.13663 | 15.8851 | 1.0168 | 5.6418 | 4.1382 | 4.7348 | 2.6861 | x | x |
| 10 | | External 500mm | 24.3314 | 23.9436 | 33.9163 | 40.7901 | 0.13558 | 16.0544 | 0.92529 | 5.3391 | 3.6619 | 3.98 | 1.9382 | x | |
| 11 | shanbhag_3dj_02_2305 | TP0-TP5 27.4dB | 27.414 | 27.2668 | 39.7417 | 45.4115 | 0.05707 | 20.5098 | 0.15032 | 5.0721 | 3.5175 | 1.9905 | 0.052272 | x | |
| 12 | | TP0-TP5 19.3dB | 19.2615 | 19.8094 | 31.3187 | 37.09 | 0.088295 | 18.5845 | 0.19937 | 6.703 | 5.7976 | 5.8174 | 4.0546 | x | x |
| 13 | | TP0-TP5 28.0dB | 27.7126 | 28.2966 | 39.7106 | 45.5274 | 0.089873 | 20.5282 | 0.12077 | 5.7527 | 3.8493 | 2.1651 | 0.21991 | x | |
| 14 | shanbhag_3dj_01_2305 | TP0-TP5 23.5dB | 23.5093 | 23.2555 | 35.423 | 41.351 | 0.16085 | 15.9775 | 0.86255 | 4.4951 | 3.6752 | 3.3999 | 1.5455 | x | |
| 15 | | TP0-TP5 25.9dB | 25.9311 | 25.6616 | 37.7637 | 43.5927 | 0.15881 | 16.7607 | 0.77498 | 4.2497 | 3.1728 | 2.4709 | 0.57448 | x | |
| 16 | weaver_3dj_elec_01_230622 | host1 150mm, host2 150mm, room temp | 21.7407 | 22.0272 | 33.0356 | 39.1232 | 0.095847 | 17.1272 | 0.94075 | 5.6358 | 4.437 | 4.7272 | 2.7335 | x | x |
| 17 | | host1 150mm, host2 150mm, high temp | 24.3128 | 24.5487 | 35.5648 | 41.6778 | 0.096646 | 17.9171 | 0.90613 | 5.3181 | 3.7417 | 3.6152 | 1.5871 | x | |
| 18 | weaver_3dj_02_2311 | host1 HH, CA-A, host2 HN, vendor Y | 23.4169 | 24.3217 | 34.729 | 40.8113 | 0.15852 | 16.6477 | 1.472 | 5.0421 | 3.6487 | 3.6152 | 1.5871 | x | |
| 19 | | host1 HH, CA-B, host2 HL, vendor Y | 26.6144 | 27.6132 | 37.8587 | 43.9932 | 0.14939 | 16.1264 | 1.1745 | 4.2487 | 2.6507 | -0.49792 | -0.49792 | x | |
| 20 | | host1 HN, CA-B, host2 HN, vendor Y | 25.1857 | 26.2401 | 36.4209 | 42.5509 | 0.15243 | 16.3062 | 1.2638 | 4.4788 | 3.0485 | 2.2955 | 0.3365 | x | |
| 21 | | host1 HN, CA-C, hosst2 HL, vendor Y | 28.5224 | 29.5245 | 39.6505 | 45.8497 | 0.14894 | 16.409 | 1.0179 | 3.5853 | 1.7449 | -2.0418 | -2.0418 | x | |
| 22 | kocsis_3dj_02_2305 | config 3, host1 4dB, cable 1.5m, host2 4dB | 26.6484 | 27.6629 | 37.9955 | 44.0577 | 0.16851 | 16.0875 | 1.3974 | 4.2955 | 2.4411 | -0.48971 | -0.48971 | x | |
| 23 | | config 4, host1 3dB, cable 1m, host2 9dB | 26.7388 | 27.8445 | 37.956 | 44.0924 | 0.17463 | 15.2592 | 1.3913 | 4.2293 | 2.3609 | -0.57143 | -0.57143 | x | |
| 24 | | config 5, host1 9dB, cable 1m, host2 3dB | 26.7388 | 27.8445 | 37.9603 | 44.0941 | 0.17463 | 15.2592 | 1.3913 | 4.1839 | 2.3154 | -0.57143 | -0.57143 | x | |
| 25 | lim_3dj_03_230629 | Design A | 28.0458 | 28.4533 | 38.2284 | 44.8606 | 0.17267 | 18.5992 | 1.7018 | 3.5111 | 1.8196 | -1.334 | -1.334 | x | |
| 26 | lim_3dj_04_230629 | Design B | 28.869 | 27.7792 | 38.8244 | 45.586 | 0.15683 | 18.2444 | 0.65531 | 3.0161 | 1.608 | -1.3489 | -1.3489 | x | |

# Sweep Conditions

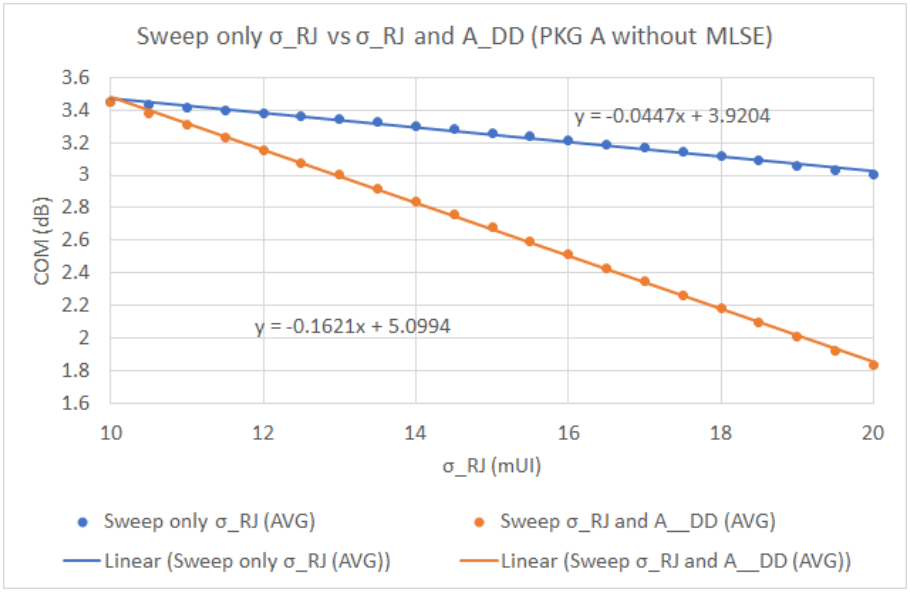
- Sweep 1 : Sweep only $\sigma_{RJ}$
  - Sweep $\sigma_{RJ}$ from 10 mUI to 20 mUI in 0.5 mUI step
  - Fix $A_{DD}$ at 20 mUI

- Sweep 2 : Sweep $\sigma_{RJ}$ and $A_{DD}$ simultaneously with the same ratio
  - Sweep $\sigma_{RJ}$ from 10 mUI to 20 mUI in 0.5 mUI step
  - Sweep $A_{DD}$ from 20 mUI to 40 mUI in 1.0 mUI step

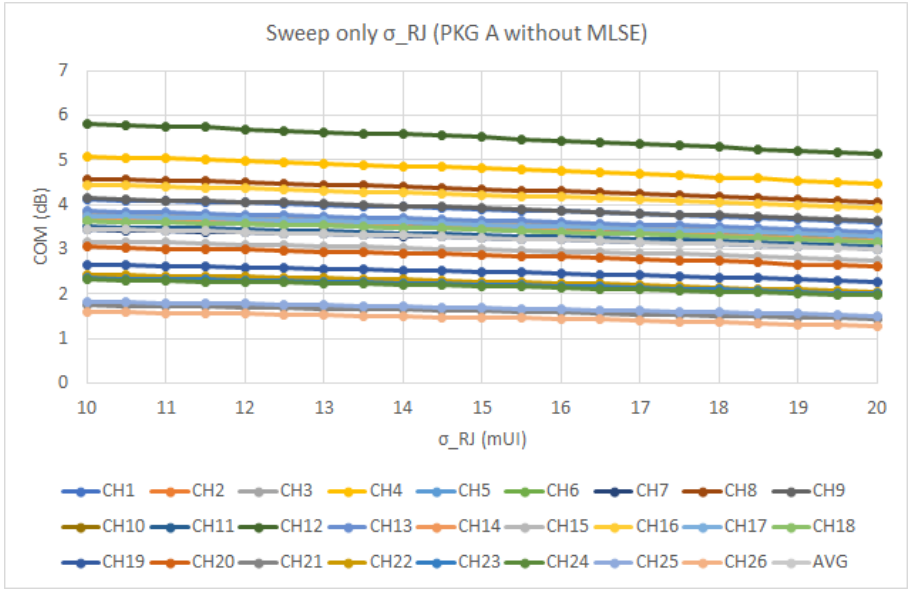
- Sweep 3 : Sweep only Tr
  - Sweep Tr from 4.0ps to 6.0ps in 0.1ps step

# Results of Sweep 1&2 w/ PKG A (without MLSE)

- Sweeping only $\sigma_{RJ}$ changes COM only moderately
- Sweeping $\sigma_{RJ}$ and $A_{DD}$ results in larger COM difference



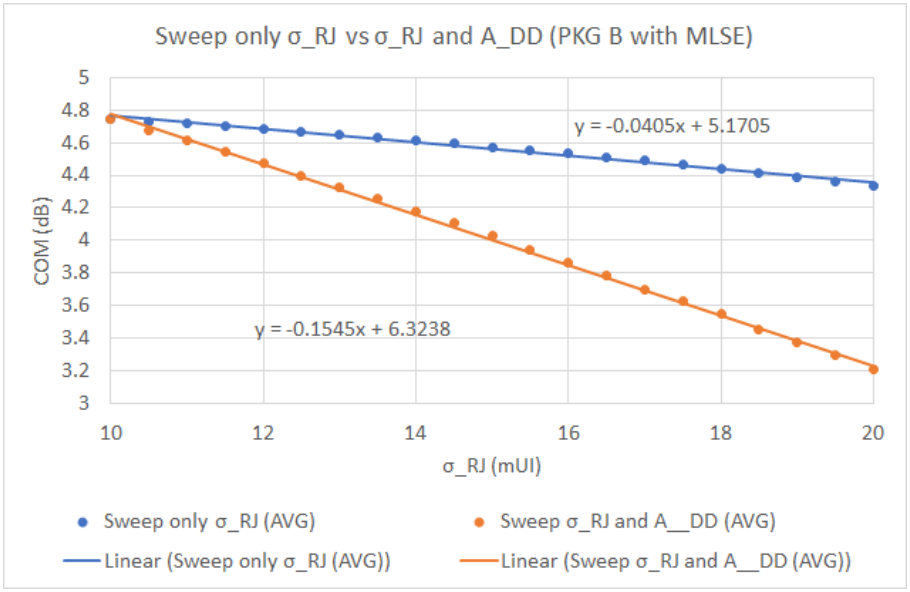

COM in average



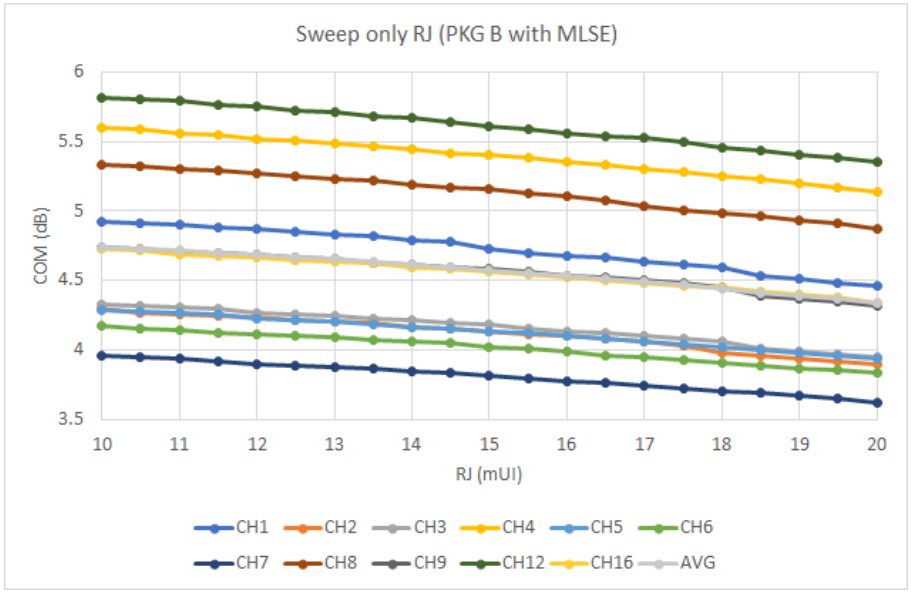

COM of each channel

# Results of Sweep 1&2 w/ PKG B (with MLSE)

- Sweeping only $\sigma_{RJ}$ changes COM only moderately
- Sweeping $\sigma_{RJ}$ and $A_{DD}$ results in larger COM difference




COM in average




COM of each channel

# Summary of Results of Sweep 1 & 2

- COM difference for $\sigma_{RJ}$ = 15.0mUI from 10mUI with $A_{DD}$ = 20mUI is about 0.18dB

Sweep only σ_RJ

| σ_RJ | A_DD | COM (dB) | | | dCOM | | |
|---|---|---|---|---|---|---|---|
| mUI rms | mUI pk | PKG A w/o MLSE 26 CHs | PKG B w/ MLSE 11 CHs | AVG | PKG A w/o MLSE 26 CHs | PKG B w/ MLSE 11 CHs | AVG |
| 10.0 | 20 | 3.452912 | 4.742791 | 4.097851 | 0 | 0 | 0 |
| 10.5 | 20 | 3.436073 | 4.729791 | 4.082932 | -0.01684 | -0.013 | -0.01492 |
| 11.0 | 20 | 3.418831 | 4.715573 | 4.067202 | -0.03408 | -0.02722 | -0.03065 |
| 11.5 | 20 | 3.402381 | 4.699636 | 4.051009 | -0.05053 | -0.04315 | -0.04684 |
| 12.0 | 20 | 3.384735 | 4.682382 | 4.033558 | -0.06818 | -0.06041 | -0.06429 |
| 12.5 | 20 | 3.366715 | 4.666073 | 4.016394 | -0.0862 | -0.07672 | -0.08146 |
| 13.0 | 20 | 3.345092 | 4.651409 | 3.998251 | -0.10782 | -0.09138 | -0.0996 |
| 13.5 | 20 | 3.325669 | 4.633582 | 3.979626 | -0.12724 | -0.10921 | -0.11823 |
| 14.0 | 20 | 3.3056 | 4.614691 | 3.960145 | -0.14731 | -0.1281 | -0.13771 |
| 14.5 | 20 | 3.283423 | 4.597264 | 3.940343 | -0.16949 | -0.14553 | -0.15751 |
| 15.0 | 20 | 3.261904 | 4.574964 | 3.918434 | -0.19101 | -0.16783 | -0.17942 |
| 15.5 | 20 | 3.239185 | 4.553818 | 3.896501 | -0.21373 | -0.18897 | -0.20135 |
| 16.0 | 20 | 3.215796 | 4.532491 | 3.874144 | -0.23712 | -0.2103 | -0.22371 |
| 16.5 | 20 | 3.191473 | 4.513882 | 3.852677 | -0.26144 | -0.22891 | -0.24517 |
| 17.0 | 20 | 3.167681 | 4.491773 | 3.829727 | -0.28523 | -0.25102 | -0.26812 |
| 17.5 | 20 | 3.141208 | 4.468509 | 3.804858 | -0.3117 | -0.27428 | -0.29299 |
| 18.0 | 20 | 3.117088 | 4.441736 | 3.779412 | -0.33582 | -0.30105 | -0.31844 |
| 18.5 | 20 | 3.088696 | 4.4111 | 3.749898 | -0.36422 | -0.33169 | -0.34795 |
| 19.0 | 20 | 3.060958 | 4.388036 | 3.724497 | -0.39195 | -0.35475 | -0.37335 |
| 19.5 | 20 | 3.034265 | 4.364873 | 3.699569 | -0.41865 | -0.37792 | -0.39828 |
| 20.0 | 20 | 3.006127 | 4.338536 | 3.672332 | -0.44678 | -0.40425 | -0.42552 |

Sweep σ_RJ and A_DD

| σ_RJ | A_DD | COM (dB) | | | dCOM | | |
|---|---|---|---|---|---|---|---|
| mUI rms | mUI pk | PKG A w/o MLSE 26 CHs | PKG B w/ MLSE 11 CHs | AVG | PKG A w/o MLSE 26 CHs | PKG B w/ MLSE 11 CHs | AVG |
| 10.0 | 20 | 3.452912 | 4.742791 | 4.097851 | 0 | 0 | 0 |
| 10.5 | 21 | 3.380985 | 4.679218 | 4.030101 | -0.07193 | -0.06357 | -0.06775 |
| 11.0 | 22 | 3.309512 | 4.613418 | 3.961465 | -0.1434 | -0.12937 | -0.13639 |
| 11.5 | 23 | 3.234262 | 4.543964 | 3.889113 | -0.21865 | -0.19883 | -0.20874 |
| 12.0 | 24 | 3.156638 | 4.473691 | 3.815165 | -0.29627 | -0.2691 | -0.28269 |
| 12.5 | 25 | 3.077377 | 4.396055 | 3.736716 | -0.37553 | -0.34674 | -0.36114 |
| 13.0 | 26 | 3.001277 | 4.326127 | 3.663702 | -0.45163 | -0.41666 | -0.43415 |
| 13.5 | 27 | 2.919192 | 4.254045 | 3.586619 | -0.53372 | -0.48875 | -0.51123 |
| 14.0 | 28 | 2.841219 | 4.179773 | 3.510496 | -0.61169 | -0.56302 | -0.58736 |
| 14.5 | 29 | 2.762642 | 4.107482 | 3.435062 | -0.69027 | -0.63531 | -0.66279 |
| 15.0 | 30 | 2.680096 | 4.026855 | 3.353475 | -0.77282 | -0.71594 | -0.74438 |
| 15.5 | 31 | 2.597932 | 3.944682 | 3.271307 | -0.85498 | -0.79811 | -0.82654 |
| 16.0 | 32 | 2.51553 | 3.859682 | 3.187606 | -0.93738 | -0.88311 | -0.91025 |
| 16.5 | 33 | 2.432946 | 3.783682 | 3.108314 | -1.01997 | -0.95911 | -0.98954 |
| 17.0 | 34 | 2.349994 | 3.700736 | 3.025365 | -1.10292 | -1.04205 | -1.07249 |
| 17.5 | 35 | 2.267328 | 3.626527 | 2.946928 | -1.18558 | -1.11626 | -1.15092 |
| 18.0 | 36 | 2.180478 | 3.545691 | 2.863084 | -1.27243 | -1.1971 | -1.23477 |
| 18.5 | 37 | 2.093207 | 3.452073 | 2.77264 | -1.3597 | -1.29072 | -1.32521 |
| 19.0 | 38 | 2.013534 | 3.376218 | 2.694876 | -1.43938 | -1.36657 | -1.40298 |
| 19.5 | 39 | 1.926112 | 3.294264 | 2.610188 | -1.5268 | -1.44853 | -1.48766 |
| 20.0 | 40 | 1.836115 | 3.208573 | 2.522344 | -1.6168 | -1.53422 | -1.57551 |

# $\sigma_{RJ}$ and $A_{DD}$ vs Calculated $J_{RMS}$ and $J_{3u}/J_{4u}$

- If we keep $A_{DD}$ 20mUI and compare the cases with 15 mUI and 10 mUI $\sigma_{RJ}$, the difference of $J_{RMS}$ is 11.8%, $J_{3u}$ is 30.4% and $J_{4u}$ is 32.5%.

| $\sigma_{RJ}$ (mUI) | $A_{DD}$ (mUI) | $J_{RMS}$ (mUI) | $J_{RMS}$ (ratio) | $J_{3u}$ (mUI) | $J_{3u}$ (ratio) | $J_{4u}$ (mUI) | $J_{4u}$ (ratio) |
|---|---|---|---|---|---|---|---|
| 10.0 | 20 | 22.3607 | 100.000% | 101.810 | 100.000% | 114.385 | 100.000% |
| 10.5 | 20 | 22.5887 | 101.020% | 104.900 | 103.035% | 118.104 | 103.251% |
| 11.0 | 20 | 22.8254 | 102.078% | 107.990 | 106.071% | 121.823 | 106.503% |
| 11.5 | 20 | 23.0705 | 103.175% | 111.080 | 109.106% | 125.542 | 109.754% |
| 12.0 | 20 | 23.3238 | 104.307% | 114.171 | 112.141% | 129.261 | 113.005% |
| 12.5 | 20 | 23.5850 | 105.475% | 117.261 | 115.177% | 132.980 | 116.257% |
| 13.0 | 20 | 23.8537 | 106.677% | 120.351 | 118.212% | 136.699 | 119.508% |
| 13.5 | 20 | 24.1299 | 107.912% | 123.441 | 121.247% | 140.418 | 122.759% |
| 14.0 | 20 | 24.4131 | 109.179% | 126.532 | 124.282% | 144.137 | 126.010% |
| 14.5 | 20 | 24.7032 | 110.476% | 129.622 | 127.318% | 147.856 | 129.262% |
| **15.0** | **20** | **25.0000** | **111.803%** | **132.712** | **130.353%** | **151.576** | **132.513%** |

# $\sigma_{RJ}$ and $A_{DD}$ vs $J_{RMS}$ and $J_{3u}/J_{4u}$ in 100G spec

- Current jitter specs for 100G/L interfaces:

| Interface | $\sigma_{RJ}$ (mUI) | $A_{DD}$ (mUI) | $J_{RMS}$ (mUI) | $J_{3u03}$ (mUI) | $J_{3u}$ (mUI) | $J_{4u03}$ (mUI) | $J_{4u}$ (mUI) |
|---|---|---|---|---|---|---|---|
| CR (100G/L) | 10 | 20 | 23 | 115 | 125 | | |
| KR (100G/L) | 10 | 20 | 23 | 106 | 115 | | |
| C2C (100G/L) | 10 | 20 | 23 | | | 118 | 128 |

# $\sigma_{RJ}$ and $A_{DD}$ vs $J_{RMS}$ and $J_{3u}/J_{4u}$ in 200G spec with 15mUI $\sigma_{RJ}$

- Compared to 100G spec, we can relax $J_{RMS}$ by 11.8% in terms of UI, $J_{3u}$ by 30.4% and $J_{4u}$ by 32.5%.

| Interface | $\sigma_{RJ}$ (mUI) | $A_{DD}$ (mUI) | $J_{RMS}$ (mUI) | $J_{3u03}$ (mUI) | $J_{3u}$ (mUI) | $J_{4u03}$ (mUI) | $J_{4u}$ (mUI) |
|---|---|---|---|---|---|---|---|
| CR (200G/L) | 15 | 20 | 25.7 | 150 | 163 | | |
| KR (200G/L) | 15 | 20 | 25.7 | 138 | 150 | | |
| C2C (200G/L) | 15 | 20 | 25.7 | | | 156 | 170 |

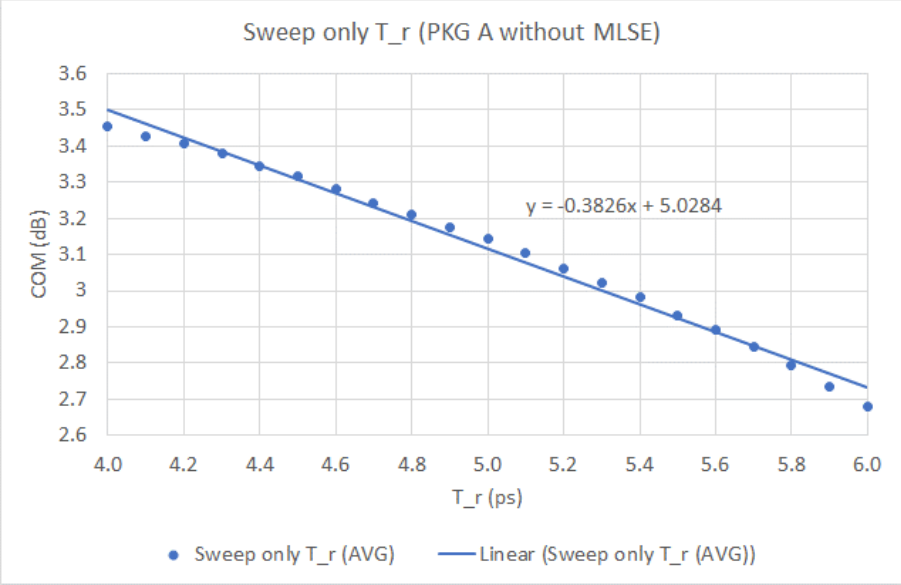
# Alternative Option: CRU bandwidth

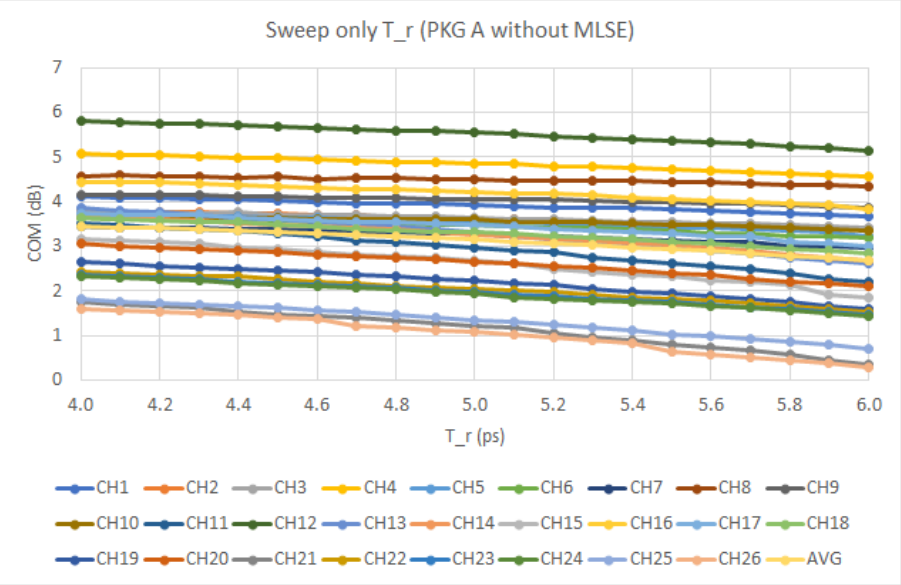
- If linearly scaling jitter parameters are preferred, an alternative option to alleviate implementation challenge due to jitter is to raise CRU bandwidth.
  - TX jitter measurement is lower with higher-bandwidth CDR.
  - TX implementation cost is relaxed by raising CRU bandwidth from 4MHz to a higher value such as 8MHz to keep the same CDR bandwidth to Baud rate ratio.

- This is a viable option. For example, PCIe Gen6 (32Gbaud, PAM4) specifies JTOL SJ mask with 10MHz corner frequency.

# Results of Sweep 3 w/ PKG A (without MLSE)

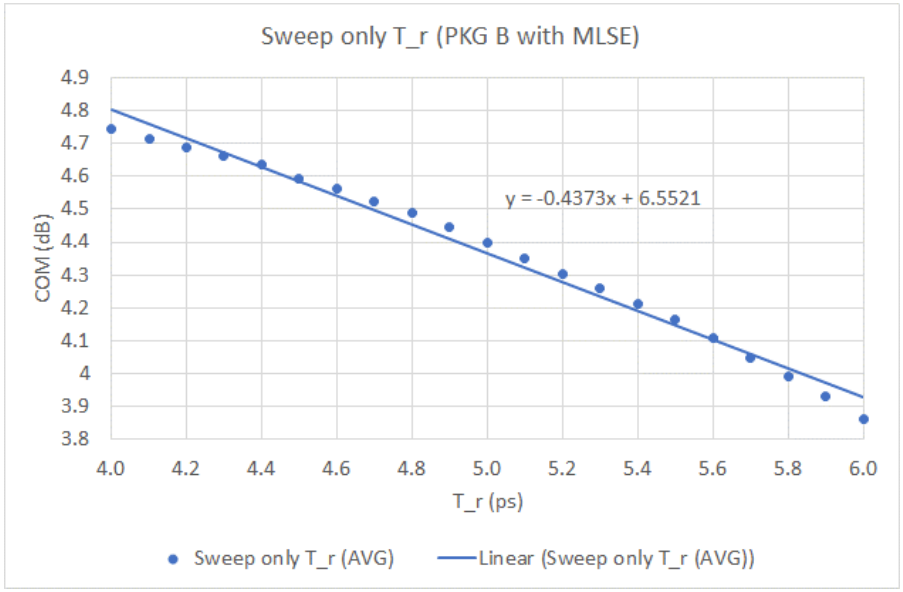
- Sweeping only Tr degrades COM rather significantly

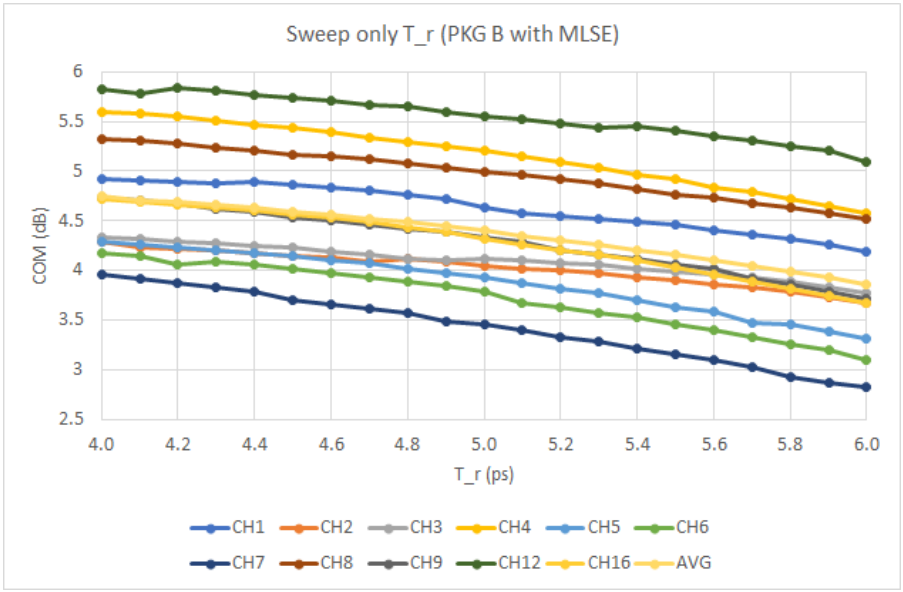


# Results of Sweep 3 w/ PKG B (with MLSE)

- Sweeping only Tr degrades COM rather significantly



# Summary of Results of Sweep 3

- COM difference of Tr=4.6ps from 4.0ps is 0.18dB.
- This small Tr is tough to achieve with power and cost constraint.
  - We need further study from TX implementation point of view.

Sweep only T_r

| T_r | COM (dB) | | | dCOM | | |
|---|---|---|---|---|---|---|
| ps | PKG A w/o MLSE 26 CHs | PKG B w/ MLSE 11 CHs | AVG | PKG A w/o MLSE 26 CHs | PKG B w/ MLSE 11 CHs | AVG |
| 4.0 | 3.452912 | 4.742791 | 4.097851 | 0 | 0 | 0 |
| 4.1 | 3.426023 | 4.712482 | 4.069252 | -0.02689 | -0.03031 | -0.0286 |
| 4.2 | 3.405231 | 4.688118 | 4.046674 | -0.04768 | -0.05467 | -0.05118 |
| 4.3 | 3.377885 | 4.6612 | 4.019542 | -0.07503 | -0.08159 | -0.07831 |
| 4.4 | 3.344554 | 4.633909 | 3.989231 | -0.10836 | -0.10888 | -0.10862 |
| 4.5 | 3.315277 | 4.592536 | 3.953907 | -0.13763 | -0.15025 | -0.14394 |
| 4.6 | 3.281058 | 4.562464 | 3.921761 | -0.17185 | -0.18033 | -0.17609 |
| 4.7 | 3.243115 | 4.525191 | 3.884153 | -0.2098 | -0.2176 | -0.2137 |
| 4.8 | 3.210946 | 4.486718 | 3.848832 | -0.24197 | -0.25607 | -0.24902 |
| 4.9 | 3.176635 | 4.444527 | 3.810581 | -0.27628 | -0.29826 | -0.28727 |
| 5.0 | 3.145323 | 4.399191 | 3.772257 | -0.30759 | -0.3436 | -0.32559 |
| 5.1 | 3.104046 | 4.349836 | 3.726941 | -0.34887 | -0.39295 | -0.37091 |
| 5.2 | 3.061775 | 4.302673 | 3.682224 | -0.39114 | -0.44012 | -0.41563 |
| 5.3 | 3.023071 | 4.258155 | 3.640613 | -0.42984 | -0.48464 | -0.45724 |
| 5.4 | 2.981498 | 4.211536 | 3.596517 | -0.47141 | -0.53125 | -0.50133 |
| 5.5 | 2.932187 | 4.163745 | 3.547966 | -0.52072 | -0.57905 | -0.54988 |
| 5.6 | 2.890078 | 4.109364 | 3.499721 | -0.56283 | -0.63343 | -0.59813 |
| 5.7 | 2.84614 | 4.048673 | 3.447406 | -0.60677 | -0.69412 | -0.65045 |
| 5.8 | 2.791844 | 3.991636 | 3.39174 | -0.66107 | -0.75115 | -0.70611 |
| 5.9 | 2.736114 | 3.931245 | 3.33368 | -0.7168 | -0.81155 | -0.76417 |
| 6.0 | 2.677969 | 3.860518 | 3.269244 | -0.77494 | -0.88227 | -0.82861 |

# Summary

- Propose $\sigma_{RJ}$ and $A_{DD}$ to be 15mUI and 20mUI for 200G KR/CR COM analysis. The complete proposal with TX jitter parameters is in page 12.
  - TX $J_{RMS}$ spec is 25.7mUI. TX $J_{3u}$ spec is 163mUI for CR, and 150mUI for KR.
  - COM difference between 10mUI and 15mUI $\sigma_{RJ}$ is only 0.18dB COM.

- An alternative option to effectively overcome TX jitter challenge is to raise CRU bandwidth to 8 MHz. It keeps jitter parameters the same in the standard and reduces residual jitters after tracking.

- More study is needed to determine Tr for 200G KR/CR COM analysis.
  - Chaning Tr from 4ps to 4.6ps has a minor impact of 0.18dB COM.
  - Implementing Tr=4.6ps over PVT might still be a challenge.

# Back up

# COM parameters for KR/CR channels (package A w/o MLSE)

| Table 93A-1 parameters | | | |
|---|---|---|---|
| **Parameter** | **Setting** | **Units** | **Information** |
| f_b | 106.25 | GBd | |
| f_min | 0.05 | GHz | |
| Delta_f | 0.01 | GHz | |
| C_d | [0.4e-4 0.9e-4 1.1e-4 ;0.4e-4 0.9e-4 1.1e-4 ] | nF | [TX RX] |
| L_s | [0.13 0.15 0.14; 0.13 0.15 0.14 ] | nH | [TX RX] |
| C_b | [0.3e-4 0.3e-4 ] | nF | [TX RX] |
| R_0 | 50 | Ohm | |
| R_d | [ 45 45] | Ohm | [TX RX] |
| A_v | 0.386 | V | vp/vf= |
| A_fe | 0.386 | V | vp/vf= |
| A_ne | 0.6 | V | |
| L | 4 | | |
| M | 32 | | |
| **filter and Eq** | | | |
| f_r | 0.58 | *fb | |
| c(0) | 0.55 | | min |
| c(-1) | [ -0.3:0.05:0 ] | | [min:step:max] |
| c(-2) | [ 0:.05:0.1 ] | | [min:step:max] |
| c(-3) | 0 | | [min:step:max] |
| c(-4) | 0 | | [min:step:max] |
| c(1) | 0 | | [min:step:max] |
| N_b | 1 | UI | |
| b_max(1) | 0.75 | | As/dffe1 |
| b_max(2..N_b) | 0.3 | | As/dfe2..N_b |
| b_min(1) | 0 | | As/dffe1 |
| b_min(2..N_b) | -0.15 | S | As/dfe2..N_b |
| g_DC | [-15:1:-3] | dB | [min:step:max] |
| f_z | 25.16 | GHz | |
| f_p1 | 40.00 | GHz | |
| f_p2 | 56.00 | GHz | |
| g_DC_HP | [-5:1:0] | | [min:step:max] |
| f_HP_PZ | 1.328125 | GHz | |

| I/O control | | |
|---|---|---|
| DIAGNOSTICS | 1 | logical |
| DISPLAY_WINDOW | 0 | logical |
| CSV_REPORT | 1 | logical |
| RESULT_DIR | .\results\CACR_set1_{date}\ | |
| SAVE_FIGURES | 0 | logical |
| Port Order | **[ 1 3 2 4 ]** | |
| RUNTAG | KR_set1_eval_ | |
| COM_CONTRIBUTION | 1 | logical |
| **TDR and ERL options** | | |
| TDR | 1 | logical |
| ERL | 1 | logical |
| ERL_ONLY | 0 | ns |
| TR_TDR | 0.01 | |
| N | 4000 | logical |
| TDR_Butterworth | 1 | |
| beta_x | 0 | |
| rho_x | 0.618 | |
| TDR_W_TXPKG | 0 | UI |
| N_bx | 20 | |
| fixture delay time | [ 0 0 ] | |
| Tukey_Window | 1 | |
| **Noise, jitter** | | |
| sigma_RJ | 0.01 | UI |
| A_DD | 0.02 | V^2/GHz |
| eta_0 | 4.00E-09 | dB |
| SNR_TX | 33 | |
| R_LM | 0.95 | |
| benartsi_3df_01a_2211 | | |
| mli_3df_02_220316 | | |

| Table 93A–3 parameters | | | |
|---|---|---|---|
| **Parameter** | **Setting** | **Units** | Information |
| package_tl_gamma0_a1_a2 | [5e-4 8.9e-4 2e-4] | | |
| package_tl_tau | 0.006141 | ns/mm | |
| package_Z_c | [87.5 87.5 ; 92.5 92.5; 100 100; 100 100] | Ohm | |
| z_p select | [2] | | [test cases to run] |
| z_p (TX) | [ 12 33 ; 1.8 1.8 ; 0 0 ; 0 0 ] | mm | [test cases] |
| z_p (NEXT) | [ 12 31 ; 1.8 1.8 ; 0 0 ; 0 0 ] | mm | [test cases] |
| z_p (FEXT) | [ 12 33 ; 1.8 1.8 ; 0 0 ; 0 0 ] | mm | [test cases] |
| z_p (RX) | [ 12 31 ; 1.8 1.8 ; 0 0 ; 0 0 ] | mm | [test cases] |
| C_p | [0.4e-4 0.4e-4] | nF | [TX RX] |
| **Filter: Rx FFE** | | | |
| ffe_pre_tap_len | **6** | UI | |
| ffe_post_tap_len | 45 | UI | |
| ffe_tap_step_size | 0 | | |
| ffe_main_cursor_min | 0.7 | | |
| ffe_pre_tap1_max | 0.7 | | |
| ffe_post_tap1_max | 0.7 | | |
| ffe_tapn_max | 0.7 | | |
| **Operational** | | | |
| ERL Pass threshold | 10 | dB | |
| COM Pass threshold | 3 | db | |
| DER_0 | 1.00E-04 | | |
| T_r | 0.00400 | ns | |
| FORCE_TR | 1 | logical | |
| PMD_type | C2C | | |
| EW | 1 | | |
| MLSE | 0 | logical | |
| ts_anchor | 1 | | |
| sample_adjustment | [ -8 8 ] | | |
| Local Search | 2 | | |

| SAVE_CONFIG2MAT | 0 | |
|---|---|---|
| **Receiver testing** | | |
| RX_CALIBRATION | 0 | logical |
| Sigma BBN step | 5.00E-03 | V |
| **ICN parameters** | | |
| f_v | 0.278 | Fb |
| f_f | 0.278 | Fb |
| f_n | 0.278 | Fb |
| f_2 | 61.625 | GHz |
| A_ft | 0.450 | V |
| **A_nt** | 0.450 | V |

| **Parameter** | **Setting** | |
|---|---|---|
| board_tl_gamma0_a1_a2 | *6.44084e-4 3.6036e-0* | 1.4 db/in @ 53.125G |
| board_tl_tau | *5.790E-03* | ns/mm |
| board_Z_c | 100 | Ohm |
| z_bp (TX) | *32* | mm |
| z_bp (NEXT) | *32* | mm |
| z_bp (FEXT) | *32* | mm |
| z_bp (RX) | *32* | mm |
| C_0 | [0.2e-4 0] | nF |
| C_1 | [0.2e-4 0] | nF |
| **Include PCB** | **0** | **logical** |
| **Seletions (rectangle, gaussian,dual_rayleigh,triangle** | | |
| Histogram_Window_Weight | gaussian | selection |
| Qr | *0.02* | UI |
| **Floating Tap Control** | | |
| N_bg | **0** | 0 1 2 or 3 groups |
| N_bf | 4 | taps per group |
| N_f | 80 | UI span for floating taps |
| bmaxg | 0.2 | max DFE value for floating taps |
| B_float_RSS_MAX | 0.1 | rss tail tap limit |
| N_tail_start | 25 | (UI) start of tail taps limit |

# COM parameters for KR/CR channels (package B w/ MLSE)

| Table 93A-1 parameters | | | |
|---|---|---|---|
| **Parameter** | **Setting** | **Units** | **Information** |
| f_b | 106.25 | GBd | |
| f_min | 0.05 | GHz | |
| Delta_f | 0.01 | GHz | |
| C_d | [0.4e-4 0.9e-4 1.1e-4 ;0.4e-4 0.9e-4 1.1e-4 ] | nF | [TX RX] |
| L_s | [0.13 0.15 0.14; 0.13 0.15 0.14 ] | nH | [TX RX] |
| C_b | [0.3e-4 0.3e-4 ] | nF | [TX RX] |
| R_0 | 50 | Ohm | |
| R_d | [ 45 45] | Ohm | [TX RX] |
| A_v | 0.386 | V | vp/vf= |
| A_fe | 0.386 | V | vp/vf= |
| A_ne | 0.6 | V | |
| L | 4 | | |
| M | 32 | | |
| **filter and Eq** | | | |
| f_r | 0.58 | *fb | |
| c(0) | 0.55 | | min |
| c(-1) | [ -0.3:0.05:0 ] | | [min:step:max] |
| c(-2) | [ 0:.05:0.1 ] | | [min:step:max] |
| c(-3) | 0 | | [min:step:max] |
| c(-4) | 0 | | [min:step:max] |
| c(1) | 0 | | [min:step:max] |
| N_b | 1 | UI | |
| b_max(1) | 0.75 | | As/dffe1 |
| b_max(2..N_b) | 0.3 | | As/dfe2..N_b |
| b_min(1) | 0 | | As/dffe1 |
| b_min(2..N_b) | -0.15 | S | As/dfe2..N_b |
| g_DC | [-15:1:-3] | dB | [min:step:max] |
| f_z | 25.16 | GHz | |
| f_p1 | 40.00 | GHz | |
| f_p2 | 56.00 | GHz | |
| g_DC_HP | [-5:1:0] | | [min:step:max] |
| f_HP_PZ | 1.328125 | GHz | |

| I/O control | | |
|---|---|---|
| DIAGNOSTICS | 1 | logical |
| DISPLAY_WINDOW | 0 | logical |
| CSV_REPORT | 1 | logical |
| RESULT_DIR | .\results\CACR_set1_{date}\ | |
| SAVE_FIGURES | 0 | logical |
| Port Order | **[ 1 3 2 4 ]** | |
| RUNTAG | KR_set1_eval_ | |
| COM_CONTRIBUTION | 1 | logical |
| **TDR and ERL options** | | |
| TDR | 1 | logical |
| ERL | 1 | logical |
| ERL_ONLY | 0 | ns |
| TR_TDR | 0.01 | |
| N | 4000 | logical |
| TDR_Butterworth | 1 | |
| beta_x | 0 | |
| rho_x | 0.618 | |
| TDR_W_TXPKG | 0 | UI |
| N_bx | 20 | |
| fixture delay time | [ 0 0 ] | |
| Tukey_Window | 1 | |
| **Noise, jitter** | | |
| sigma_RJ | 0.01 | UI |
| A_DD | 0.02 | V^2/GHz |
| eta_0 | 4.00E-09 | dB |
| SNR_TX | 33 | |
| R_LM | 0.95 | |
| benartsi_3df_01a_2211 | | |
| mli_3df_02_220316 | | |

| Table 93A–3 parameters | | | |
|---|---|---|---|
| Parameter | Setting | Units | Information |
| package_tl_gamma0_a1_a2 | [5e-4 6.5e-4 3e-4] | | |
| package_tl_tau | 0.006141 | ns/mm | |
| package_Z_c | [92 92 ; 70 70; 80 80; 100 100] | Ohm | |
| z_p select | [4] | | [test cases to run] |
| z_p (TX) | [ 8 24 30 45 ; 1 1 1 1 ; 1 1 1 1 ; 0.5 0.5 0.5 0.5 ] | mm | [test cases] |
| z_p (NEXT) | [ 8 22 28 43 ; 1 1 1 1 ; 1 1 1 1 ; 0.5 0.5 0.5 0.5 ] | mm | [test cases] |
| z_p (FEXT) | [ 8 24 30 45 ; 1 1 1 1 ; 1 1 1 1 ; 0.5 0.5 0.5 0.5 ] | mm | [test cases] |
| z_p (RX) | [ 8 22 28 43 ; 1 1 1 1 ; 1 1 1 1 ; 0.5 0.5 0.5 0.5 ] | mm | [test cases] |
| C_p | [0.4e-4 0.4e-4] | nF | [TX RX] |
| **Filter: Rx FFE** | | | |
| ffe_pre_tap_len | **6** | UI | |
| ffe_post_tap_len | 45 | UI | |
| ffe_tap_step_size | 0 | | |
| ffe_main_cursor_min | 0.7 | | |
| ffe_pre_tap1_max | 0.7 | | |
| ffe_post_tap1_max | 0.7 | | |
| ffe_tapn_max | 0.7 | | |
| **Operational** | | | |
| ERL Pass threshold | 10 | dB | |
| COM Pass threshold | 3 | db | |
| DER_0 | 1.00E-04 | | |
| T_r | 0.00400 | ns | |
| FORCE_TR | 1 | logical | |
| PMD_type | C2C | | |
| EW | 1 | | |
| MLSE | 1 | logical | |
| ts_anchor | 1 | | |
| sample_adjustment | [ -8 8 ] | | |
| Local Search | 2 | | |

| | | |
|---|---|---|
| SAVE_CONFIG2MAT | 0 | |
| **Receiver testing** | | |
| RX_CALIBRATION | 0 | logical |
| Sigma BBN step | 5.00E-03 | V |
| **ICN parameters** | | |
| f_v | 0.278 | Fb |
| f_f | 0.278 | Fb |
| f_n | 0.278 | Fb |
| f_2 | 61.625 | GHz |
| A_ft | 0.450 | V |
| **A_nt** | 0.450 | V |
| **Parameter** | **Setting** | |
| board_tl_gamma0_a1_a2 | *6.44084e-4 3.6036e-0* | 1.4 db/in @ 53.125G |
| board_tl_tau | *5.790E-03* | ns/mm |
| board_Z_c | 100 | Ohm |
| z_bp (TX) | *32* | mm |
| z_bp (NEXT) | *32* | mm |
| z_bp (FEXT) | *32* | mm |
| z_bp (RX) | *32* | mm |
| C_0 | [0.2e-4 0] | nF |
| C_1 | [0.2e-4 0] | nF |
| **Include PCB** | **0** | **logical** |
| **Seletions (rectangle, gaussian,dual_rayleigh,triangle** | | |
| Histogram_Window_Weight | gaussian | selection |
| Qr | *0.02* | UI |
| **Floating Tap Control** | | |
| N_bg | **0** | 0 1 2 or 3 groups |
| N_bf | 4 | taps per group |
| N_f | 80 | UI span for floating taps |
| bmaxg | 0.2 | max DFE value for floating taps |
| B_float_RSS_MAX | 0.1 | rss tail tap limit |
| N_tail_start | 25 | (UI) start of tail taps limit |

# Detail Results of Sweep 1

- With PKG A (without MLSE)

Sweep only σ_RJ with PKG A

| A_DD | σ_RJ | CH1 | CH2 | CH3 | CH4 | CH5 | CH6 | CH7 | CH8 | CH9 | CH10 | CH11 | CH12 | CH13 | CH14 | CH15 | CH16 | CH17 | CH18 | CH19 | CH20 | CH21 | CH22 | CH23 | CH24 | CH25 | CH26 | AVG | dAVG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mUI pk | mUI rms | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB |
| 20 | 10.0 | 4.1102 | 3.8088 | 3.7906 | 5.0673 | 3.7017 | 3.6487 | 3.4397 | 4.5797 | 4.1382 | 3.6619 | 3.5175 | 5.7976 | 3.8493 | 3.6752 | 3.1728 | 4.437 | 3.7417 | 3.6487 | 2.6507 | 3.0485 | 1.7449 | 2.4411 | 2.3609 | 2.3154 | 1.8196 | 1.608 | 3.452912 | 0 |
| 20 | 10.5 | 4.0963 | 3.7819 | 3.7648 | 5.0518 | 3.6884 | 3.6223 | 3.4139 | 4.5667 | 4.1242 | 3.6487 | 3.4915 | 5.7809 | 3.8358 | 3.6619 | 3.1603 | 4.4225 | 3.7284 | 3.6223 | 2.6389 | 3.0239 | 1.7343 | 2.4296 | 2.3381 | 2.3041 | 1.8089 | 1.5975 | 3.436073 | -0.01684 |
| 20 | 11.0 | 4.0824 | 3.7685 | 3.7448 | 5.0362 | 3.6752 | 3.6091 | 3.4011 | 4.5408 | 4.0963 | 3.6355 | 3.4785 | 5.7476 | 3.8223 | 3.6355 | 3.1478 | 4.3937 | 3.7017 | 3.6091 | 2.6271 | 3.0116 | 1.7237 | 2.4066 | 2.3268 | 2.2928 | 1.7982 | 1.5767 | 3.418831 | -0.03408 |
| 20 | 11.5 | 4.0546 | 3.7551 | 3.7316 | 5.0053 | 3.6487 | 3.596 | 3.3882 | 4.5279 | 4.0824 | 3.6091 | 3.4655 | 5.7311 | 3.8088 | 3.6223 | 3.1229 | 4.3793 | 3.6884 | 3.5828 | 2.6036 | 2.9993 | 1.7131 | 2.3952 | 2.3154 | 2.2815 | 1.7875 | 1.5663 | 3.402381 | -0.05053 |
| 20 | 12.0 | 4.0408 | 3.7284 | 3.7051 | 4.9744 | 3.6355 | 3.5697 | 3.3754 | 4.5021 | 4.0546 | 3.596 | 3.4526 | 5.698 | 3.7819 | 3.596 | 3.1105 | 4.3649 | 3.6752 | 3.5697 | 2.5919 | 2.9871 | 1.7026 | 2.3837 | 2.3041 | 2.2702 | 1.7768 | 1.5559 | 3.384735 | -0.06818 |
| 20 | 12.5 | 4.0132 | 3.7017 | 3.6919 | 4.959 | 3.6223 | 3.5566 | 3.3498 | 4.4764 | 4.0408 | 3.5828 | 3.4268 | 5.665 | 3.7685 | 3.5828 | 3.098 | 4.3362 | 3.6487 | 3.5436 | 2.5802 | 2.9626 | 1.692 | 2.3723 | 2.2928 | 2.2589 | 1.7662 | 1.5455 | 3.366715 | -0.0862 |
| 20 | 13.0 | 3.9857 | 3.6884 | 3.6655 | 4.9283 | 3.596 | 3.5305 | 3.3371 | 4.4508 | 4.0132 | 3.5566 | 3.4139 | 5.6322 | 3.7417 | 3.5566 | 3.0733 | 4.3219 | 3.6355 | 3.5305 | 2.5569 | 2.9504 | 1.6709 | 2.3495 | 2.2702 | 2.2364 | 1.7556 | 1.5248 | 3.345092 | -0.10782 |
| 20 | 13.5 | 3.9719 | 3.6619 | 3.6524 | 4.8978 | 3.5828 | 3.5045 | 3.3116 | 4.438 | 3.9994 | 3.5436 | 3.3882 | 5.5994 | 3.715 | 3.5305 | 3.0609 | 4.2934 | 3.6091 | 3.5045 | 2.5452 | 2.926 | 1.6604 | 2.3381 | 2.2589 | 2.2252 | 1.7343 | 1.5144 | 3.325669 | -0.12724 |
| 20 | 14.0 | 3.9445 | 3.6487 | 3.6261 | 4.8673 | 3.5566 | 3.4915 | 3.2989 | 4.4125 | 3.9719 | 3.5175 | 3.3626 | 5.5831 | 3.7017 | 3.5175 | 3.0362 | 4.265 | 3.596 | 3.4785 | 2.5336 | 2.9139 | 1.6499 | 2.3154 | 2.2364 | 2.2028 | 1.7237 | 1.4938 | 3.3056 | -0.14731 |
| 20 | 14.5 | 3.9172 | 3.6223 | 3.6 | 4.8369 | 3.5305 | 3.4655 | 3.2735 | 4.3871 | 3.9582 | 3.4915 | 3.3498 | 5.5506 | 3.6752 | 3.4915 | 3.0116 | 4.2366 | 3.5697 | 3.4655 | 2.5104 | 2.8896 | 1.6289 | 2.3041 | 2.2252 | 2.1916 | 1.7026 | 1.4834 | 3.283423 | -0.16949 |
| 20 | 15.0 | 3.89 | 3.596 | 3.5869 | 4.8066 | 3.5175 | 3.4397 | 3.2609 | 4.3491 | 3.9309 | 3.4785 | 3.3243 | 5.5182 | 3.6487 | 3.4655 | 2.9993 | 4.2225 | 3.5436 | 3.4397 | 2.4872 | 2.8775 | 1.6184 | 2.2815 | 2.2028 | 2.1693 | 1.692 | 1.4629 | 3.261904 | -0.19101 |
| 20 | 15.5 | 3.8764 | 3.5697 | 3.5609 | 4.7765 | 3.4915 | 3.4139 | 3.2356 | 4.3238 | 3.9036 | 3.4526 | 3.2989 | 5.4698 | 3.6355 | 3.4397 | 2.9748 | 4.1943 | 3.5175 | 3.4139 | 2.4756 | 2.8534 | 1.5975 | 2.2702 | 2.1916 | 2.1581 | 1.6709 | 1.4526 | 3.239185 | -0.21373 |
| 20 | 16.0 | 3.8493 | 3.5436 | 3.5349 | 4.7464 | 3.4655 | 3.3882 | 3.2104 | 4.2986 | 3.8764 | 3.4268 | 3.2862 | 5.4377 | 3.6091 | 3.4139 | 2.9504 | 4.1662 | 3.5045 | 3.3882 | 2.4526 | 2.8293 | 1.5871 | 2.2477 | 2.1693 | 2.1359 | 1.6604 | 1.4321 | 3.215796 | -0.23712 |
| 20 | 16.5 | 3.8223 | 3.5175 | 3.509 | 4.7165 | 3.4397 | 3.3754 | 3.1853 | 4.2735 | 3.8358 | 3.4011 | 3.2609 | 5.4057 | 3.5828 | 3.3882 | 2.926 | 4.1382 | 3.4785 | 3.3626 | 2.4296 | 2.8052 | 1.5663 | 2.2252 | 2.1581 | 2.1137 | 1.6394 | 1.4218 | 3.191473 | -0.26144 |
| 20 | 17.0 | 3.7953 | 3.4915 | 3.4832 | 4.6866 | 3.4139 | 3.3498 | 3.1603 | 4.236 | 3.8088 | 3.3754 | 3.2356 | 5.3738 | 3.5566 | 3.3626 | 2.9139 | 4.1102 | 3.4526 | 3.3371 | 2.4181 | 2.7813 | 1.5455 | 2.2028 | 2.1359 | 2.1026 | 1.6289 | 1.4014 | 3.167681 | -0.28523 |
| 20 | 17.5 | 3.7551 | 3.4655 | 3.4575 | 4.6569 | 3.3882 | 3.3243 | 3.1478 | 4.2111 | 3.7819 | 3.3498 | 3.2104 | 5.3262 | 3.5305 | 3.3371 | 2.8896 | 4.0824 | 3.4268 | 3.3116 | 2.3952 | 2.7574 | 1.5248 | 2.1581 | 2.1137 | 2.0805 | 1.608 | 1.381 | 3.141208 | -0.3117 |
| 20 | 18.0 | 3.7284 | 3.4397 | 3.4318 | 4.6125 | 3.3754 | 3.2989 | 3.1229 | 4.1862 | 3.7551 | 3.3243 | 3.1853 | 5.2946 | 3.5045 | 3.3116 | 2.8654 | 4.0546 | 3.4011 | 3.2862 | 2.3723 | 2.7454 | 1.5144 | 2.1359 | 2.0915 | 2.0585 | 1.5871 | 1.3607 | 3.117088 | -0.33582 |
| 20 | 18.5 | 3.7017 | 3.4139 | 3.4062 | 4.583 | 3.3371 | 3.2735 | 3.098 | 4.1491 | 3.7284 | 3.2989 | 3.1603 | 5.2475 | 3.4655 | 3.2735 | 2.8413 | 4.0132 | 3.3754 | 3.2482 | 2.3495 | 2.7217 | 1.4938 | 2.1137 | 2.0695 | 2.0365 | 1.5663 | 1.3404 | 3.088696 | -0.36422 |
| 20 | 19.0 | 3.6752 | 3.3754 | 3.3807 | 4.5389 | 3.3116 | 3.2482 | 3.0733 | 4.1121 | 3.7017 | 3.2735 | 3.1353 | 5.2162 | 3.4397 | 3.2482 | 2.8172 | 3.9857 | 3.3371 | 3.223 | 2.3268 | 2.6624 | 1.4732 | 2.0915 | 2.0475 | 2.0145 | 1.5559 | 1.3201 | 3.060958 | -0.39195 |
| 20 | 19.5 | 3.6487 | 3.3498 | 3.3426 | 4.5097 | 3.2862 | 3.2104 | 3.0485 | 4.0875 | 3.6752 | 3.2482 | 3.1105 | 5.1694 | 3.4139 | 3.223 | 2.7813 | 3.9582 | 3.3116 | 3.1979 | 2.3041 | 2.6389 | 1.4526 | 2.0695 | 2.0255 | 1.9927 | 1.5351 | 1.2999 | 3.034265 | -0.41865 |
| 20 | 20.0 | 3.6091 | 3.3243 | 3.3172 | 4.466 | 3.2609 | 3.1853 | 3.0116 | 4.0508 | 3.6487 | 3.223 | 3.0733 | 5.1384 | 3.3882 | 3.1853 | 2.7574 | 3.9172 | 3.2862 | 3.1603 | 2.2815 | 2.6154 | 1.4321 | 2.0585 | 2.0036 | 1.9708 | 1.5144 | 1.2798 | 3.006127 | -0.44678 |

- With PKG B (with MLSE)

Sweep only σ_RJ with PKG B

| A_DD | σ_RJ | CH1 | CH2 | CH3 | CH4 | CH5 | CH6 | CH7 | CH8 | CH9 | CH12 | CH16 | AVG | dAVG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mUI pk | mUI rms | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB |
| 20 | 10.0 | 4.9269 | 4.2941 | 4.3284 | 5.5984 | 4.2864 | 4.1698 | 3.9583 | 5.329 | 4.7348 | 5.8174 | 4.7272 | 4.742791 | 0 |
| 20 | 10.5 | 4.9147 | 4.2713 | 4.317 | 5.5854 | 4.2751 | 4.1586 | 3.9475 | 5.3164 | 4.7229 | 5.8035 | 4.7153 | 4.729791 | -0.013 |
| 20 | 11.0 | 4.9025 | 4.2599 | 4.3055 | 5.5593 | 4.2638 | 4.1475 | 3.9367 | 5.3038 | 4.7111 | 5.7897 | 4.6915 | 4.715573 | -0.02722 |
| 20 | 11.5 | 4.8781 | 4.2485 | 4.2941 | 5.5463 | 4.2525 | 4.1253 | 3.919 | 5.2911 | 4.6993 | 5.7621 | 4.6797 | 4.699636 | -0.04315 |
| 20 | 12.0 | 4.866 | 4.2371 | 4.2713 | 5.5203 | 4.23 | 4.1142 | 3.8975 | 5.266 | 4.6875 | 5.7484 | 4.6679 | 4.682382 | -0.06041 |
| 20 | 12.5 | 4.8538 | 4.2145 | 4.2599 | 5.5074 | 4.2188 | 4.1031 | 3.8867 | 5.2534 | 4.664 | 5.7209 | 4.6443 | 4.666073 | -0.07672 |
| 20 | 13.0 | 4.8296 | 4.2031 | 4.2485 | 5.4815 | 4.2076 | 4.0921 | 3.8828 | 5.2283 | 4.6523 | 5.7072 | 4.6325 | 4.651409 | -0.09138 |
| 20 | 13.5 | 4.8175 | 4.1918 | 4.2258 | 5.4686 | 4.1852 | 4.07 | 3.8652 | 5.2158 | 4.6289 | 5.6799 | 4.6207 | 4.633582 | -0.10921 |
| 20 | 14.0 | 4.7934 | 4.1693 | 4.2145 | 5.4429 | 4.1671 | 4.059 | 3.8438 | 5.1909 | 4.6172 | 5.6663 | 4.5972 | 4.614691 | -0.1281 |
| 20 | 14.5 | 4.7813 | 4.158 | 4.1918 | 5.4172 | 4.156 | 4.048 | 3.8331 | 5.166 | 4.5939 | 5.6391 | 4.5855 | 4.597264 | -0.14553 |
| 20 | 15.0 | 4.7226 | 4.1355 | 4.1805 | 5.4044 | 4.1337 | 4.026 | 3.8118 | 5.1536 | 4.5823 | 5.612 | 4.5622 | 4.574964 | -0.16783 |
| 20 | 15.5 | 4.6986 | 4.1131 | 4.158 | 5.3789 | 4.1226 | 4.0081 | 3.8011 | 5.1288 | 4.559 | 5.585 | 4.5388 | 4.553818 | -0.18897 |
| 20 | 16.0 | 4.6747 | 4.1019 | 4.1355 | 5.3534 | 4.1004 | 3.9863 | 3.7799 | 5.1041 | 4.5359 | 5.5581 | 4.5272 | 4.532491 | -0.2103 |
| 20 | 16.5 | 4.6628 | 4.0796 | 4.1243 | 5.328 | 4.0783 | 3.9644 | 3.7693 | 5.0794 | 4.5243 | 5.5383 | 4.504 | 4.513882 | -0.22891 |
| 20 | 17.0 | 4.639 | 4.0573 | 4.1019 | 5.3027 | 4.0672 | 3.9536 | 3.7481 | 5.0328 | 4.5012 | 5.5249 | 4.4808 | 4.491773 | -0.25102 |
| 20 | 17.5 | 4.6152 | 4.0351 | 4.0796 | 5.2774 | 4.0452 | 3.9318 | 3.7269 | 5.0083 | 4.4782 | 5.4982 | 4.4577 | 4.468509 | -0.27428 |
| 20 | 18.0 | 4.5916 | 3.9821 | 4.0573 | 5.2522 | 4.0232 | 3.9101 | 3.699 | 4.9838 | 4.4553 | 5.4583 | 4.4462 | 4.441736 | -0.30105 |
| 20 | 18.5 | 4.5331 | 3.96 | 4.0113 | 5.2271 | 4.0012 | 3.8885 | 3.6953 | 4.9594 | 4.3913 | 5.4317 | 4.4232 | 4.4111 | -0.33169 |
| 20 | 19.0 | 4.5095 | 3.9379 | 3.9891 | 5.2021 | 3.9794 | 3.8669 | 3.6743 | 4.9351 | 4.3686 | 5.4053 | 4.4002 | 4.388036 | -0.35475 |
| 20 | 19.5 | 4.4861 | 3.9159 | 3.967 | 5.1647 | 3.9575 | 3.8561 | 3.6534 | 4.9108 | 4.3459 | 5.3789 | 4.3773 | 4.364873 | -0.37792 |
| 20 | 20.0 | 4.4627 | 3.8939 | 3.9449 | 5.1398 | 3.9358 | 3.8346 | 3.6256 | 4.8745 | 4.3164 | 5.3526 | 4.3431 | 4.338536 | -0.40425 |

# Detail Results of Sweep 2

- With PKG A (without MLSE)

Sweep σ_RJ and A_DD with PKG A

| A_DD | σ_RJ | CH1 | CH2 | CH3 | CH4 | CH5 | CH6 | CH7 | CH8 | CH9 | CH10 | CH11 | CH12 | CH13 | CH14 | CH15 | CH16 | CH17 | CH18 | CH19 | CH20 | CH21 | CH22 | CH23 | CH24 | CH25 | CH26 | AVG | dAVG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mUI pk | mUI rms | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB |
| 20 | 10.0 | 4.1102 | 3.8088 | 3.7906 | 5.0673 | 3.7017 | 3.6487 | 3.4397 | 4.5797 | 4.1382 | 3.6619 | 3.5175 | 5.7976 | 3.8493 | 3.6752 | 3.1728 | 4.437 | 3.7417 | 3.6487 | 2.6507 | 3.0485 | 1.7449 | 2.4411 | 2.3609 | 2.3154 | 1.8196 | 1.608 | 3.452912 | N/A |
| 21 | 10.5 | 4.0408 | 3.715 | 3.7183 | 4.9744 | 3.6355 | 3.5697 | 3.3626 | 4.5021 | 4.0546 | 3.596 | 3.4526 | 5.698 | 3.7685 | 3.596 | 3.098 | 4.3649 | 3.6752 | 3.5566 | 2.5919 | 2.9748 | 1.692 | 2.3837 | 2.2928 | 2.2589 | 1.7768 | 1.5559 | 3.380985 | -0.07193 |
| 22 | 11.0 | 3.9445 | 3.6487 | 3.6392 | 4.8825 | 3.5566 | 3.5045 | 3.2989 | 4.4125 | 3.9857 | 3.5175 | 3.3754 | 5.5994 | 3.7017 | 3.5175 | 3.0362 | 4.2792 | 3.596 | 3.4915 | 2.5336 | 2.9139 | 1.6394 | 2.3268 | 2.2364 | 2.2028 | 1.7131 | 1.4938 | 3.309512 | -0.1434 |
| 23 | 11.5 | 3.8764 | 3.5697 | 3.5609 | 4.7916 | 3.4915 | 3.4139 | 3.223 | 4.3238 | 3.89 | 3.4397 | 3.2989 | 5.4698 | 3.6223 | 3.4397 | 2.9626 | 4.1943 | 3.5175 | 3.4011 | 2.4641 | 2.8534 | 1.5871 | 2.2589 | 2.1804 | 2.147 | 1.6709 | 1.4423 | 3.234262 | -0.21865 |
| 24 | 12.0 | 3.7819 | 3.4785 | 3.4832 | 4.6717 | 3.4139 | 3.3371 | 3.1603 | 4.236 | 3.8088 | 3.3754 | 3.223 | 5.3738 | 3.5305 | 3.3498 | 2.8896 | 4.1102 | 3.4397 | 3.3243 | 2.4066 | 2.7813 | 1.5351 | 2.1581 | 2.1137 | 2.0805 | 1.6184 | 1.3912 | 3.156638 | -0.29627 |
| 25 | 12.5 | 3.7017 | 3.4011 | 3.3934 | 4.5683 | 3.3371 | 3.2609 | 3.0856 | 4.1491 | 3.715 | 3.2862 | 3.1478 | 5.2632 | 3.4526 | 3.2609 | 2.8293 | 4.0132 | 3.3626 | 3.2356 | 2.3381 | 2.6861 | 1.4732 | 2.1026 | 2.0475 | 2.0145 | 1.5559 | 1.3303 | 3.077377 | -0.37553 |
| 26 | 13.0 | 3.6223 | 3.3243 | 3.3172 | 4.4794 | 3.2609 | 3.1728 | 3.0116 | 4.0508 | 3.6355 | 3.2104 | 3.0733 | 5.1539 | 3.3754 | 3.1853 | 2.7454 | 3.9309 | 3.2735 | 3.1603 | 2.2702 | 2.6154 | 1.4218 | 2.0365 | 1.9927 | 1.9599 | 1.4938 | 1.2597 | 3.001277 | -0.45163 |
| 27 | 13.5 | 3.5175 | 3.2356 | 3.2292 | 4.3663 | 3.1853 | 3.098 | 2.926 | 3.9536 | 3.5436 | 3.1229 | 2.9993 | 5.046 | 3.2862 | 3.098 | 2.6743 | 3.8358 | 3.1979 | 3.0733 | 2.2028 | 2.5336 | 1.3607 | 1.9708 | 1.9165 | 1.8841 | 1.4321 | 1.2096 | 2.919192 | -0.53372 |
| 28 | 14.0 | 3.4397 | 3.1603 | 3.1544 | 4.2684 | 3.0856 | 3.0239 | 2.8534 | 3.8695 | 3.4655 | 3.0485 | 2.9017 | 4.9394 | 3.1979 | 3.0116 | 2.5919 | 3.7417 | 3.1105 | 2.9993 | 2.1359 | 2.4641 | 1.2999 | 1.9165 | 1.8518 | 1.8196 | 1.3708 | 1.1499 | 2.841219 | -0.61169 |
| 29 | 14.5 | 3.3498 | 3.0609 | 3.0803 | 4.158 | 3.0116 | 2.9504 | 2.7813 | 3.7442 | 3.3754 | 2.9626 | 2.8293 | 4.8342 | 3.1229 | 2.9382 | 2.522 | 3.6487 | 3.0362 | 2.9139 | 2.0585 | 2.3952 | 1.2396 | 1.8518 | 1.7875 | 1.7556 | 1.3201 | 1.1005 | 2.762642 | -0.69027 |
| 30 | 15.0 | 3.2609 | 2.9993 | 2.9889 | 4.0624 | 2.926 | 2.8534 | 2.6979 | 3.661 | 3.2989 | 2.8896 | 2.7574 | 4.7006 | 3.0362 | 2.8534 | 2.4411 | 3.5566 | 2.9382 | 2.8293 | 1.9927 | 2.3154 | 1.1698 | 1.7662 | 1.7237 | 1.692 | 1.2496 | 1.022 | 2.680096 | -0.77282 |
| 31 | 15.5 | 3.1478 | 2.9017 | 2.9061 | 3.9679 | 2.8534 | 2.7813 | 2.6154 | 3.567 | 3.2104 | 2.7932 | 2.6743 | 4.5977 | 2.9504 | 2.7574 | 2.3723 | 3.4655 | 2.8534 | 2.7217 | 1.9165 | 2.2477 | 1.1103 | 1.7131 | 1.6499 | 1.6184 | 1.1996 | 0.95384 | 2.597932 | -0.85498 |
| 32 | 16.0 | 3.0733 | 2.8172 | 2.8241 | 3.848 | 2.7574 | 2.6979 | 2.5336 | 3.474 | 3.1229 | 2.7217 | 2.5919 | 4.4805 | 2.8654 | 2.6743 | 2.2815 | 3.3626 | 2.7693 | 2.6389 | 1.841 | 2.1581 | 1.0513 | 1.6499 | 1.5871 | 1.5559 | 1.1301 | 0.89587 | 2.51553 | -0.93738 |
| 33 | 16.5 | 2.9871 | 2.7335 | 2.7198 | 3.7558 | 2.6743 | 2.6036 | 2.4526 | 3.382 | 3.0239 | 2.6389 | 2.5104 | 4.3793 | 2.7574 | 2.5919 | 2.214 | 3.2735 | 2.6861 | 2.5569 | 1.7768 | 2.0915 | 0.98297 | 1.5767 | 1.5144 | 1.4834 | 1.0611 | 0.82872 | 2.432946 | -1.01997 |
| 34 | 17.0 | 2.8896 | 2.6389 | 2.6395 | 3.6386 | 2.5919 | 2.522 | 2.3837 | 3.2796 | 2.9504 | 2.5569 | 2.4181 | 4.2508 | 2.6743 | 2.5104 | 2.1359 | 3.1853 | 2.6036 | 2.4756 | 1.7026 | 2.0145 | 0.91515 | 1.5041 | 1.4423 | 1.4116 | 1.0024 | 0.76209 | 2.349994 | -1.10292 |
| 35 | 17.5 | 2.8052 | 2.5569 | 2.5713 | 3.5486 | 2.522 | 2.4411 | 2.3041 | 3.1896 | 2.8413 | 2.4641 | 2.3381 | 4.1522 | 2.5802 | 2.4181 | 2.0475 | 3.098 | 2.5104 | 2.3837 | 1.6289 | 1.9382 | 0.84785 | 1.4218 | 1.3708 | 1.3404 | 0.92481 | 0.70538 | 2.267328 | -1.18558 |
| 36 | 18.0 | 2.7098 | 2.4756 | 2.47 | 3.4469 | 2.4296 | 2.3609 | 2.214 | 3.1005 | 2.7574 | 2.3723 | 2.2589 | 4.0408 | 2.4988 | 2.3381 | 1.9817 | 2.9871 | 2.4296 | 2.3041 | 1.5455 | 1.8625 | 0.79058 | 1.3505 | 1.2496 | 1.2296 | 0.86703 | 0.62101 | 2.180478 | -1.27243 |
| 37 | 18.5 | 2.6154 | 2.3837 | 2.392 | 3.3214 | 2.3495 | 2.2702 | 2.1359 | 2.9904 | 2.6743 | 2.2815 | 2.1693 | 3.9309 | 2.3837 | 2.2477 | 1.8841 | 2.9017 | 2.3381 | 2.214 | 1.4732 | 1.7768 | 0.71481 | 1.2697 | 1.1797 | 1.1598 | 0.80963 | 0.55594 | 2.093207 | -1.3597 |
| 38 | 19.0 | 2.5336 | 2.3041 | 2.2927 | 3.2223 | 2.2702 | 2.1916 | 2.0585 | 2.9033 | 2.5919 | 2.2028 | 2.0805 | 3.8223 | 2.3041 | 2.1693 | 1.8089 | 2.8052 | 2.2477 | 2.1359 | 1.4014 | 1.692 | 0.64904 | 1.2096 | 1.1202 | 1.1005 | 0.73369 | 0.50056 | 2.013534 | -1.43938 |
| 39 | 19.5 | 2.4181 | 2.214 | 2.2054 | 3.1242 | 2.1804 | 2.1026 | 1.9708 | 2.8064 | 2.4988 | 2.1137 | 2.0036 | 3.6884 | 2.214 | 2.0695 | 1.7237 | 2.7098 | 2.1581 | 2.0475 | 1.3201 | 1.608 | 0.58377 | 1.14 | 1.0513 | 1.0317 | 0.66778 | 0.42726 | 1.926112 | -1.5268 |
| 40 | 20.0 | 2.3381 | 2.1026 | 2.1137 | 3.0239 | 2.0805 | 1.9599 | 1.8841 | 2.7211 | 2.3952 | 2.0255 | 1.9057 | 3.5828 | 2.1248 | 1.9817 | 1.6499 | 2.5802 | 2.0695 | 1.9599 | 1.2396 | 1.5351 | 0.50977 | 1.071 | 0.97325 | 0.96354 | 0.59306 | 0.35458 | 1.836115 | -1.6168 |

- With PKG B (with MLSE)

Sweep σ_RJ and A_DD with PKG B

| A_DD | σ_RJ | CH1 | CH2 | CH3 | CH4 | CH5 | CH6 | CH7 | CH8 | CH9 | CH12 | CH16 | AVG | dAVG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mUI pk | mUI rms | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB |
| 20 | 10.0 | 4.9269 | 4.2941 | 4.3284 | 5.5984 | 4.2864 | 4.1698 | 3.9583 | 5.329 | 4.7348 | 5.8174 | 4.7272 | 4.742791 | 0 |
| 21 | 10.5 | 4.866 | 4.2258 | 4.2713 | 5.5203 | 4.23 | 4.1142 | 3.8975 | 5.266 | 4.664 | 5.7484 | 4.6679 | 4.679218 | -0.06357 |
| 22 | 11.0 | 4.7934 | 4.1693 | 4.2145 | 5.4429 | 4.1629 | 4.059 | 3.8438 | 5.1909 | 4.6055 | 5.6799 | 4.5855 | 4.613418 | -0.12937 |
| 23 | 11.5 | 4.6866 | 4.1019 | 4.158 | 5.3661 | 4.1004 | 4.0041 | 3.7905 | 5.1164 | 4.5474 | 5.585 | 4.5272 | 4.543964 | -0.19883 |
| 24 | 12.0 | 4.6271 | 4.0154 | 4.0908 | 5.29 | 4.0452 | 3.9427 | 3.7269 | 5.0205 | 4.4782 | 5.5045 | 4.4693 | 4.473691 | -0.2691 |
| 25 | 12.5 | 4.5095 | 3.9379 | 4.0113 | 5.2146 | 3.9794 | 3.8777 | 3.6743 | 4.9472 | 4.3799 | 5.4246 | 4.4002 | 4.396055 | -0.34674 |
| 26 | 13.0 | 4.451 | 3.883 | 3.9339 | 5.1275 | 3.9249 | 3.8132 | 3.6152 | 4.8625 | 4.312 | 5.3325 | 4.3317 | 4.326127 | -0.41666 |
| 27 | 13.5 | 4.3696 | 3.8175 | 3.8681 | 5.0343 | 3.86 | 3.7492 | 3.5425 | 4.7905 | 4.2377 | 5.2613 | 4.2638 | 4.254045 | -0.48875 |
| 28 | 14.0 | 4.3005 | 3.7417 | 3.8028 | 4.9488 | 3.7849 | 3.6856 | 3.4909 | 4.6954 | 4.1708 | 5.1709 | 4.1852 | 4.179773 | -0.56302 |
| 29 | 14.5 | 4.2206 | 3.6773 | 3.738 | 4.8762 | 3.7141 | 3.6225 | 3.4226 | 4.6248 | 4.1044 | 5.0814 | 4.1004 | 4.107482 | -0.63531 |
| 30 | 15.0 | 4.1413 | 3.6028 | 3.6666 | 4.7252 | 3.6402 | 3.553 | 3.3685 | 4.5432 | 4.0276 | 4.9928 | 4.0342 | 4.026855 | -0.71594 |
| 31 | 15.5 | 4.074 | 3.5394 | 3.5112 | 4.6304 | 3.5878 | 3.4805 | 3.2809 | 4.4622 | 3.9515 | 4.9052 | 3.9684 | 3.944682 | -0.79811 |
| 32 | 16.0 | 3.985 | 3.3852 | 3.427 | 4.5483 | 3.5149 | 3.4188 | 3.2208 | 4.3821 | 3.876 | 4.806 | 3.8924 | 3.859682 | -0.88311 |
| 33 | 16.5 | 3.9079 | 3.3125 | 3.3644 | 4.467 | 3.4427 | 3.3474 | 3.1513 | 4.2958 | 3.7943 | 4.7202 | 3.817 | 3.783682 | -0.95911 |
| 34 | 17.0 | 3.7786 | 3.2507 | 3.3022 | 4.375 | 3.3539 | 3.2696 | 3.0853 | 4.2059 | 3.7201 | 4.6352 | 3.7316 | 3.700736 | -1.04205 |
| 35 | 17.5 | 3.7137 | 3.1791 | 3.2302 | 4.2952 | 3.293 | 3.1994 | 3.0265 | 4.1169 | 3.636 | 4.5511 | 3.6507 | 3.626527 | -1.11626 |
| 36 | 18.0 | 3.6315 | 3.1011 | 3.1416 | 4.1981 | 3.2225 | 3.1297 | 2.9419 | 4.0398 | 3.5632 | 4.4559 | 3.5773 | 3.545691 | -1.1971 |
| 37 | 18.5 | 3.5359 | 3.0206 | 3.0708 | 4.1087 | 3.1357 | 3.0537 | 2.8744 | 3.8447 | 3.4841 | 4.35 | 3.4942 | 3.452073 | -1.29072 |
| 38 | 19.0 | 3.4622 | 2.9509 | 3.0007 | 4.0203 | 3.0763 | 2.9753 | 2.7911 | 3.7584 | 3.4022 | 4.2686 | 3.4324 | 3.376218 | -1.36657 |
| 39 | 19.5 | 3.3788 | 2.8817 | 2.931 | 3.9328 | 2.9977 | 2.9073 | 2.7248 | 3.6416 | 3.3312 | 4.1764 | 3.3336 | 3.294264 | -1.44853 |
| 40 | 20.0 | 3.3168 | 2.8059 | 2.8522 | 3.8462 | 2.9129 | 2.833 | 2.6496 | 3.5499 | 3.2539 | 4.0212 | 3.2527 | 3.208573 | -1.53422 |

# Detail Results of Sweep 3

- With PKG A (without MLSE)

Sweep only T_r with PKG A

| T_r | CH1 | CH2 | CH3 | CH4 | CH5 | CH6 | CH7 | CH8 | CH9 | CH10 | CH11 | CH12 | CH13 | CH14 | CH15 | CH16 | CH17 | CH18 | CH19 | CH20 | CH21 | CH22 | CH23 | CH24 | CH25 | CH26 | AVG | dAVG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ps | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB |
| 4.0 | 4.1102 | 3.8088 | 3.7906 | 5.0673 | 3.7017 | 3.6487 | 3.4397 | 4.5797 | 4.1382 | 3.6619 | 3.5175 | 5.7976 | 3.8493 | 3.6752 | 3.1728 | 4.437 | 3.7417 | 3.6487 | 2.6507 | 3.0485 | 1.7449 | 2.4411 | 2.3609 | 2.3154 | 1.8196 | 1.608 | 3.452912 | 0 |
| 4.1 | 4.0963 | 3.7819 | 3.7695 | 5.0518 | 3.6884 | 3.6223 | 3.4268 | 4.5898 | 4.1382 | 3.6619 | 3.4785 | 5.7783 | 3.8088 | 3.6487 | 3.1229 | 4.4225 | 3.715 | 3.6091 | 2.6036 | 3.0116 | 1.7026 | 2.4066 | 2.3268 | 2.2928 | 1.7556 | 1.5663 | 3.426023 | -0.02689 |
| 4.2 | 4.0824 | 3.7819 | 3.7601 | 5.0362 | 3.7017 | 3.6091 | 3.4011 | 4.5597 | 4.1382 | 3.6752 | 3.4268 | 5.7578 | 3.7685 | 3.6223 | 3.0856 | 4.4225 | 3.715 | 3.5828 | 2.5685 | 2.9748 | 1.6604 | 2.3723 | 2.3041 | 2.2702 | 1.7237 | 1.5351 | 3.405231 | -0.04768 |
| 4.3 | 4.0685 | 3.7685 | 3.7364 | 5.0207 | 3.6752 | 3.6091 | 3.4139 | 4.5678 | 4.1382 | 3.6487 | 3.3754 | 5.7302 | 3.715 | 3.5828 | 3.0485 | 4.3937 | 3.6884 | 3.5566 | 2.522 | 2.9382 | 1.6184 | 2.3381 | 2.2702 | 2.2252 | 1.6815 | 1.4938 | 3.377885 | -0.07503 |
| 4.4 | 4.0408 | 3.7417 | 3.7509 | 4.9898 | 3.6619 | 3.596 | 3.3754 | 4.5483 | 4.1242 | 3.6355 | 3.3371 | 5.7134 | 3.6487 | 3.5175 | 2.9748 | 4.3793 | 3.6355 | 3.5305 | 2.4872 | 2.9017 | 1.5351 | 2.3154 | 2.214 | 2.1804 | 1.6604 | 1.4629 | 3.344554 | -0.10836 |
| 4.5 | 4.027 | 3.7284 | 3.7114 | 4.9744 | 3.6355 | 3.5697 | 3.3754 | 4.5544 | 4.1102 | 3.6355 | 3.2735 | 5.6967 | 3.596 | 3.4785 | 2.926 | 4.3505 | 3.6223 | 3.4915 | 2.4526 | 2.8654 | 1.4834 | 2.2815 | 2.1804 | 2.147 | 1.6184 | 1.4116 | 3.315277 | -0.13763 |
| 4.6 | 3.9994 | 3.7017 | 3.715 | 4.9437 | 3.6355 | 3.5436 | 3.3498 | 4.5158 | 4.0963 | 3.6223 | 3.223 | 5.6632 | 3.5436 | 3.4526 | 2.8775 | 4.3219 | 3.5828 | 3.4526 | 2.4181 | 2.8172 | 1.4321 | 2.1916 | 2.147 | 2.1137 | 1.5767 | 1.3708 | 3.281058 | -0.17185 |
| 4.7 | 3.9719 | 3.6884 | 3.7017 | 4.9283 | 3.596 | 3.5436 | 3.3243 | 4.5415 | 4.0963 | 3.6091 | 3.1353 | 5.63 | 3.4915 | 3.4139 | 2.8172 | 4.2792 | 3.5566 | 3.3882 | 2.3609 | 2.7813 | 1.3912 | 2.1581 | 2.1026 | 2.0695 | 1.5248 | 1.2196 | 3.243115 | -0.2098 |
| 4.8 | 3.9719 | 3.6487 | 3.6752 | 4.8978 | 3.5828 | 3.5175 | 3.3116 | 4.518 | 4.0824 | 3.6091 | 3.0856 | 5.5968 | 3.4397 | 3.3754 | 2.7813 | 4.265 | 3.5305 | 3.3626 | 2.3268 | 2.7335 | 1.3303 | 2.1137 | 2.0695 | 2.0365 | 1.4526 | 1.1698 | 3.210946 | -0.24197 |
| 4.9 | 3.9445 | 3.6355 | 3.6619 | 4.8825 | 3.5566 | 3.4915 | 3.2989 | 4.5072 | 4.0685 | 3.596 | 3.0362 | 5.5803 | 3.3754 | 3.3243 | 2.7335 | 4.2366 | 3.5045 | 3.3116 | 2.2702 | 2.6979 | 1.2798 | 2.0695 | 2.0255 | 1.9927 | 1.3912 | 1.1202 | 3.176635 | -0.27628 |
| 5.0 | 3.9309 | 3.6091 | 3.6355 | 4.8521 | 3.5566 | 3.4655 | 3.2735 | 4.4953 | 4.0546 | 3.596 | 2.9748 | 5.5473 | 3.3243 | 3.2609 | 2.6743 | 4.2225 | 3.4655 | 3.3116 | 2.2252 | 2.6507 | 1.2196 | 2.0585 | 1.9927 | 1.9599 | 1.3505 | 1.071 | 3.145323 | -0.30759 |
| 5.1 | 3.89 | 3.596 | 3.6223 | 4.8369 | 3.5305 | 3.4526 | 3.2356 | 4.4824 | 4.0546 | 3.5566 | 2.9139 | 5.5145 | 3.223 | 3.223 | 2.6154 | 4.1943 | 3.4526 | 3.2735 | 2.1693 | 2.6036 | 1.1698 | 2.0145 | 1.9057 | 1.8625 | 1.2999 | 1.0122 | 3.104046 | -0.34887 |
| 5.2 | 3.8628 | 3.5828 | 3.596 | 4.7916 | 3.5175 | 3.4268 | 3.223 | 4.4827 | 4.0408 | 3.5436 | 2.8654 | 5.4492 | 3.1728 | 3.1728 | 2.4872 | 4.1662 | 3.3882 | 3.2356 | 2.1248 | 2.5569 | 1.0415 | 1.9708 | 1.8841 | 1.8196 | 1.2496 | 0.95384 | 3.061775 | -0.39114 |
| 5.3 | 3.8628 | 3.5566 | 3.5697 | 4.7916 | 3.4915 | 3.4139 | 3.1979 | 4.4821 | 4.027 | 3.5305 | 2.7454 | 5.4329 | 3.1105 | 3.1229 | 2.4296 | 4.1382 | 3.3498 | 3.1853 | 2.0475 | 2.5104 | 0.96354 | 1.9165 | 1.8303 | 1.7982 | 1.1897 | 0.9055 | 3.023071 | -0.42984 |
| 5.4 | 3.8493 | 3.5305 | 3.5566 | 4.7614 | 3.4526 | 3.3882 | 3.1728 | 4.466 | 3.9857 | 3.5175 | 2.6743 | 5.4005 | 3.0485 | 3.0733 | 2.3723 | 4.0824 | 3.3116 | 3.1603 | 1.9927 | 2.4526 | 0.89587 | 1.8625 | 1.7875 | 1.7556 | 1.1301 | 0.83828 | 2.981498 | -0.47141 |
| 5.5 | 3.8223 | 3.5045 | 3.5305 | 4.7314 | 3.4268 | 3.3498 | 3.1353 | 4.437 | 3.9857 | 3.4915 | 2.6154 | 5.3521 | 2.9871 | 3.0239 | 2.3154 | 4.0546 | 3.2735 | 3.098 | 1.9382 | 2.4066 | 0.80963 | 1.8089 | 1.7449 | 1.7131 | 1.0317 | 0.64904 | 2.932187 | -0.52072 |
| 5.6 | 3.8088 | 3.4785 | 3.5045 | 4.7015 | 3.4011 | 3.2989 | 3.1105 | 4.4225 | 3.9582 | 3.4655 | 2.5452 | 5.3361 | 2.9139 | 2.9748 | 2.2477 | 4.027 | 3.2356 | 3.0485 | 1.8841 | 2.3495 | 0.73369 | 1.7768 | 1.692 | 1.6604 | 0.98297 | 0.58377 | 2.890078 | -0.56283 |
| 5.7 | 3.7819 | 3.4526 | 3.5045 | 4.6717 | 3.3754 | 3.2735 | 3.0856 | 4.4081 | 3.9445 | 3.4397 | 2.4756 | 5.288 | 2.8293 | 2.9139 | 2.1916 | 3.9994 | 3.2104 | 2.9993 | 1.8196 | 2.2702 | 0.65841 | 1.7237 | 1.6394 | 1.6184 | 0.91515 | 0.50977 | 2.84614 | -0.60677 |
| 5.8 | 3.7417 | 3.4526 | 3.4785 | 4.6272 | 3.3498 | 3.2356 | 2.9993 | 4.3793 | 3.9172 | 3.4139 | 2.4066 | 5.2403 | 2.7454 | 2.7932 | 2.1248 | 3.9719 | 3.1105 | 2.9504 | 1.7556 | 2.2028 | 0.57448 | 1.6709 | 1.5871 | 1.5559 | 0.85744 | 0.44553 | 2.791844 | -0.66107 |
| 5.9 | 3.715 | 3.4139 | 3.4526 | 4.5977 | 3.3243 | 3.223 | 2.9993 | 4.3649 | 3.89 | 3.3882 | 2.2815 | 5.1927 | 2.6743 | 2.7454 | 1.9273 | 3.9309 | 3.0733 | 2.8896 | 1.6604 | 2.1581 | 0.43639 | 1.608 | 1.5248 | 1.5041 | 0.79058 | 0.37269 | 2.736114 | -0.7168 |
| 6.0 | 3.6752 | 3.3882 | 3.4139 | 4.5536 | 3.223 | 3.1853 | 2.9748 | 4.3362 | 3.8764 | 3.3371 | 2.1916 | 5.1455 | 2.6036 | 2.6743 | 1.8625 | 3.8223 | 3.0116 | 2.8413 | 1.5975 | 2.0915 | 0.34553 | 1.5455 | 1.4732 | 1.4423 | 0.71481 | 0.30046 | 2.677969 | -0.77494 |

- With PKG B (with MLSE)

Sweep only T_r with PKG B

| T_r | CH1 | CH2 | CH3 | CH4 | CH5 | CH6 | CH7 | CH8 | CH9 | CH12 | CH16 | AVG | dAVG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ps | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB |
| 4.0 | 4.9269 | 4.2941 | 4.3284 | 5.5984 | 4.2864 | 4.1698 | 3.9583 | 5.329 | 4.7348 | 5.8174 | 4.7272 | 4.742791 | 0 |
| 4.1 | 4.9094 | 4.2319 | 4.3125 | 5.5792 | 4.2594 | 4.1433 | 3.9151 | 5.3038 | 4.7062 | 5.783 | 4.6935 | 4.712482 | -0.03031 |
| 4.2 | 4.892 | 4.2162 | 4.2966 | 5.547 | 4.2326 | 4.0672 | 3.8721 | 5.2786 | 4.6758 | 5.8331 | 4.6581 | 4.688118 | -0.05467 |
| 4.3 | 4.8746 | 4.2005 | 4.2694 | 5.5081 | 4.2059 | 4.0893 | 3.8331 | 5.2328 | 4.6172 | 5.8126 | 4.6297 | 4.6612 | -0.08159 |
| 4.4 | 4.8866 | 4.1736 | 4.2536 | 5.4695 | 4.1793 | 4.0563 | 3.7905 | 5.2033 | 4.5939 | 5.765 | 4.6014 | 4.633909 | -0.10888 |
| 4.5 | 4.8573 | 4.1468 | 4.2266 | 5.4309 | 4.146 | 4.0126 | 3.6958 | 5.166 | 4.5359 | 5.7383 | 4.5617 | 4.592536 | -0.15025 |
| 4.6 | 4.8402 | 4.1313 | 4.1875 | 5.3926 | 4.1086 | 3.9731 | 3.6606 | 5.1536 | 4.5012 | 5.7047 | 4.5337 | 4.562464 | -0.18033 |
| 4.7 | 4.806 | 4.0935 | 4.1607 | 5.3417 | 4.0824 | 3.9367 | 3.6187 | 5.1164 | 4.4553 | 5.6713 | 4.4944 | 4.525191 | -0.2176 |
| 4.8 | 4.7585 | 4.1129 | 4.1228 | 5.2911 | 4.0235 | 3.8936 | 3.5736 | 5.0794 | 4.421 | 5.6451 | 4.4324 | 4.486718 | -0.25607 |
| 4.9 | 4.7229 | 4.0866 | 4.1075 | 5.2534 | 3.98 | 3.8438 | 3.4875 | 5.0357 | 4.3868 | 5.5988 | 4.3868 | 4.444527 | -0.29826 |
| 5.0 | 4.6325 | 4.0493 | 4.1226 | 5.2033 | 3.9298 | 3.7905 | 3.4533 | 4.9991 | 4.3346 | 5.5528 | 4.3233 | 4.399191 | -0.3436 |
| 5.1 | 4.5807 | 4.0232 | 4.1004 | 5.1536 | 3.876 | 3.678 | 3.4022 | 4.9573 | 4.2895 | 5.5203 | 4.267 | 4.349836 | -0.39295 |
| 5.2 | 4.5526 | 3.9972 | 4.07 | 5.0917 | 3.8225 | 3.636 | 3.3344 | 4.921 | 4.2111 | 5.4818 | 4.2111 | 4.302673 | -0.44012 |
| 5.3 | 4.5247 | 3.9713 | 4.0549 | 5.0304 | 3.7693 | 3.5736 | 3.284 | 4.8728 | 4.1666 | 5.4366 | 4.1555 | 4.258155 | -0.48464 |
| 5.4 | 4.4853 | 3.9348 | 4.0179 | 4.9626 | 3.7095 | 3.5253 | 3.2139 | 4.818 | 4.1113 | 5.448 | 4.1003 | 4.211536 | -0.53125 |
| 5.5 | 4.4576 | 3.9092 | 3.992 | 4.921 | 3.636 | 3.4635 | 3.1642 | 4.7703 | 4.0563 | 5.4035 | 4.0276 | 4.163745 | -0.57905 |
| 5.6 | 4.4072 | 3.8622 | 3.9554 | 4.8419 | 3.5839 | 3.4022 | 3.098 | 4.7348 | 4.0126 | 5.3465 | 3.9583 | 4.109364 | -0.63343 |
| 5.7 | 4.3686 | 3.8263 | 3.9298 | 4.7891 | 3.4737 | 3.3344 | 3.0225 | 4.6826 | 3.919 | 5.3027 | 3.8867 | 4.048673 | -0.69412 |
| 5.8 | 4.3189 | 3.7905 | 3.8828 | 4.718 | 3.4533 | 3.2639 | 2.9281 | 4.6289 | 3.8652 | 5.2466 | 3.8118 | 3.991636 | -0.75115 |
| 5.9 | 4.2558 | 3.7269 | 3.8331 | 4.6475 | 3.392 | 3.194 | 2.8702 | 4.5823 | 3.7905 | 5.2033 | 3.7481 | 3.931245 | -0.81155 |
| 6.0 | 4.1888 | 3.6743 | 3.7799 | 4.5706 | 3.3142 | 3.1079 | 2.8223 | 4.5243 | 3.7201 | 5.0958 | 3.6675 | 3.860518 | -0.88227 |

# COM parameters for C2M channels (No MLSE, host package A, module 8mm package)

| Table 93A-1 parameters | | | |
|---|---|---|---|
| **Parameter** | **Setting** | **Units** | **Information** |
| f_b | 106.25 | GBd | |
| f_min | 0.05 | GHz | |
| Delta_f | 0.01 | GHz | |
| C_d | [0.4e-4 0.9e-4 1.1e-4 ;0.4e-4 0.9e-4 1.1e-4 ] | nF | [TX RX] |
| L_s | [0.13 0.15 0.14; 0.13 0.15 0.14 ] | nH | [TX RX] |
| C_b | [0.3e-4 0.3e-4 ] | nF | [TX RX] |
| R_0 | 50 | Ohm | |
| R_d | [ 45 45] | Ohm | [TX RX] |
| A_v | 0.386 | V | vp/vf= |
| A_fe | 0.386 | V | vp/vf= |
| A_ne | 0.6 | V | |
| L | 4 | | |
| M | 32 | | |
| **filter and Eq** | | | |
| f_r | 0.58 | *fb | |
| c(0) | 0.55 | | min |
| c(-1) | [ -0.3:0.05:0 ] | | [min:step:max] |
| c(-2) | [ 0:.05:0.1 ] | | [min:step:max] |
| c(-3) | 0 | | [min:step:max] |
| c(-4) | 0 | | [min:step:max] |
| c(1) | 0 | | [min:step:max] |
| N_b | 1 | UI | |
| b_max(1) | 0.75 | | As/dffe1 |
| b_max(2..N_b) | 0.3 | | As/dfe2..N_b |
| b_min(1) | 0 | | As/dffe1 |
| b_min(2..N_b) | -0.15 | S | As/dfe2..N_b |
| g_DC | [-15:1:-3] | dB | [min:step:max] |
| f_z | 25.16 | GHz | |
| f_p1 | 40.00 | GHz | |
| f_p2 | 56.00 | GHz | |
| g_DC_HP | [-5:1:0] | | [min:step:max] |
| f_HP_PZ | 1.328125 | GHz | |

| I/O control | | |
|---|---|---|
| DIAGNOSTICS | 1 | logical |
| DISPLAY_WINDOW | 0 | logical |
| CSV_REPORT | 1 | logical |
| RESULT_DIR | .\results\C2M_{date}\ | |
| SAVE_FIGURES | 0 | logical |
| Port Order | **[ 1 3 2 4 ]** | |
| RUNTAG | C2M TP1a_COM_model | |
| COM_CONTRIBUTION | 1 | logical |
| **TDR and ERL options** | | |
| TDR | 1 | logical |
| ERL | 1 | logical |
| ERL_ONLY | 0 | ns |
| TR_TDR | 0.01 | |
| N | 3000 | logical |
| TDR_Butterworth | 1 | |
| beta_x | 0 | |
| rho_x | 0.618 | |
| TDR_W_TXPKG | 0 | UI |
| N_bx | 0 | |
| fixture delay time | [ 0 0 ] | |
| Tukey_Window | 1 | |
| **Noise, jitter** | | |
| sigma_RJ | 0.01 | UI |
| A_DD | 0.02 | UI |
| eta_0 | 6.00E-09 | V^2/GHz |
| SNR_TX | 33 | dB |
| R_LM | 0.95 | |

| Table 93A–3 parameters | | | |
|---|---|---|---|
| Parameter | Setting | Units | Information |
| package_tl_gamma0_a1_a2 | [5e-4 8.9e-4 2e-4] | | |
| package_tl_tau | 0.006141 | ns/mm | |
| package_Z_c | [87.5 87.5 ; 92.5 92.5; 100 100; 100 100] | Ohm | |
| z_p select | [2] | | [test cases to run] |
| z_p (TX) | [ 12 33 ; 1.8 1.8 ; 0 0 ; 0 0 ] | mm | [test cases] |
| z_p (NEXT) | [ 8 8 ; 0 0 ; 0 0 ; 0 0 ] | mm | [test cases] |
| z_p (FEXT) | [ 12 33 ; 1.8 1.8 ; 0 0 ; 0 0 ] | mm | [test cases] |
| z_p (RX) | [ 8 8 ; 0 0 ; 0 0 ; 0 0 ] | mm | [test cases] |
| C_p | [0.4e-4 0.4e-4] | nF | [TX RX] |
| **Filter: Rx FFE** | | | |
| ffe_pre_tap_len | **6** | UI | |
| ffe_post_tap_len | 25 | UI | |
| ffe_tap_step_size | 0 | | |
| ffe_main_cursor_min | 0.7 | | |
| ffe_pre_tap1_max | 0.7 | | |
| ffe_post_tap1_max | 0.7 | | |
| ffe_tapn_max | 0.7 | | |
| **Operational** | | | |
| ERL Pass threshold | 10 | dB | |
| COM Pass threshold | 3 | db | |
| VEC Pass threshold | 10 | db | |
| DER_0 | 2.00E-05 | | |
| T_r | 4.00E-03 | ns | |
| FORCE_TR | 1 | logical | |
| Min_VEO_Test | 0 | mV | |
| PMD_type | C2C | | |
| EH_min | 5 | Value | |
| EH_max | 1000 | Value | |
| T_O | 50 | mUI | |
| samples_for_C2M | 100 | samples/UI | |
| ts_anchor | 1 | | |
| sample_adjustment | [ -8 12 ] | | |
| EW | 1 | | |
| MLSE | 0 | | |
| Local Search | 2 | | |

| | | |
|---|---|---|
| SAVE_CONFIG2MAT | 0 | |
| **Receiver testing** | | |
| RX_CALIBRATION | 0 | logical |
| Sigma BBN step | 5.00E-03 | V |
| **ICN parameters** | | |
| f_v | 0.588 | Fb |
| f_f | 0.278 | Fb |
| f_n | 0.278 | Fb |
| f_2 | 61.625 | GHz |
| A_ft | 0.450 | V |
| **A_nt** | 0.450 | V |

| **Parameter** | **Setting** | |
|---|---|---|
| board_tl_gamma0_a1_a2 | *[0 6.44084e-4 3.6036e-05]* | 1.4 db/in @ 53.125G |
| board_tl_tau | *5.790E-03* | ns/mm |
| board_Z_c | 100 | Ohm |
| z_bp (TX) | *32* | mm |
| z_bp (NEXT) | *32* | mm |
| z_bp (FEXT) | *32* | mm |
| z_bp (RX) | *32* | mm |
| C_0 | [0.2e-4 0] | nF |
| C_1 | [0.2e-4 0] | nF |
| **Include PCB** | **0** | **logical** |
| **Seletions (rectangle, gaussian,dual_rayleigh,triangle** | | |
| Histogram_Window_Weigh | gaussian | selection |
| Qr | *0.02* | UI |
| **Floating Tap Control** | | |
| N_bg | **0** | 0 1 2 or 3 groups |
| N_bf | 4 | taps per group |
| N_f | 80 | UI span for floating taps |
| bmaxg | 0.2 | max DFE value for floating taps |
| B_float_RSS_MAX | 0.1 | rss tail tap limit |
| N_tail_start | 16 | (UI) start of tail taps limit |

| |
|---|
| benartsi_3df_01a_2211 |
| mli_3df_02_220316 |
| ran_3dj_elec_02_230622 |

# COM parameters for C2M channels (No MLSE, host package B, module 8mm package)

| Table 93A-1 parameters | | | |
|---|---|---|---|
| **Parameter** | **Setting** | **Units** | **Information** |
| f_b | 106.25 | GBd | |
| f_min | 0.05 | GHz | |
| Delta_f | 0.01 | GHz | |
| C_d | [0.4e-4 0.9e-4 1.1e-4 ;0.4e-4 0.9e-4 1.1e-4 ] | nF | [TX RX] |
| L_s | [0.13 0.15 0.14; 0.13 0.15 0.14 ] | nH | [TX RX] |
| C_b | [0.3e-4 0.3e-4 ] | nF | [TX RX] |
| R_0 | 50 | Ohm | |
| R_d | [ 45 45] | Ohm | [TX RX] |
| A_v | 0.386 | V | vp/vf= |
| A_fe | 0.386 | V | vp/vf= |
| A_ne | 0.6 | V | |
| L | 4 | | |
| M | 32 | | |
| **filter and Eq** | | | |
| f_r | 0.58 | *fb | |
| c(0) | 0.55 | | min |
| c(-1) | [ -0.3:0.05:0 ] | | [min:step:max] |
| c(-2) | [ 0:.05:0.1 ] | | [min:step:max] |
| c(-3) | 0 | | [min:step:max] |
| c(-4) | 0 | | [min:step:max] |
| c(1) | 0 | | [min:step:max] |
| N_b | 1 | UI | |
| b_max(1) | 0.75 | | As/dffe1 |
| b_max(2..N_b) | 0.3 | | As/dfe2..N_b |
| b_min(1) | 0 | | As/dffe1 |
| b_min(2..N_b) | -0.15 | S | As/dfe2..N_b |
| g_DC | [-15:1:-3] | dB | [min:step:max] |
| f_z | 25.16 | GHz | |
| f_p1 | 40.00 | GHz | |
| f_p2 | 56.00 | GHz | |
| g_DC_HP | [-5:1:0] | | [min:step:max] |
| f_HP_PZ | 1.328125 | GHz | |

| I/O control | | |
|---|---|---|
| DIAGNOSTICS | 1 | logical |
| DISPLAY_WINDOW | 0 | logical |
| CSV_REPORT | 1 | logical |
| RESULT_DIR | .\results\C2M_{date}\ | |
| SAVE_FIGURES | 0 | logical |
| Port Order | **[ 1 3 2 4 ]** | |
| RUNTAG | C2M TP1a_COM_model | |
| COM_CONTRIBUTION | 1 | logical |
| **TDR and ERL options** | | |
| TDR | 1 | logical |
| ERL | 1 | logical |
| ERL_ONLY | 0 | ns |
| TR_TDR | 0.01 | |
| N | 3000 | logical |
| TDR_Butterworth | 1 | |
| beta_x | 0 | |
| rho_x | 0.618 | |
| TDR_W_TXPKG | 0 | UI |
| N_bx | 0 | |
| fixture delay time | [ 0 0 ] | |
| Tukey_Window | 1 | |
| **Noise, jitter** | | |
| sigma_RJ | 0.01 | UI |
| A_DD | 0.02 | UI |
| eta_0 | 6.00E-09 | V^2/GHz |
| SNR_TX | 33 | dB |
| R_LM | 0.95 | |

| Table 93A–3 parameters | | | |
|---|---|---|---|
| Parameter | Setting | Units | Information |
| package_tl_gamma0_a1_a2 | [5e-4 6.5e-4 3e-4] | | |
| package_tl_tau | 0.006141 | ns/mm | |
| package_Z_c | [92 92 ; 70 70; 80 80; 100 100] | Ohm | |
| z_p select | [4] | | [test cases to run] |
| z_p (TX) | [ 8 24 30 45 ; 1 1 1 1 ; 1 1 1 1 ; 0.5 0.5 0.5 0.5 ] | mm | [test cases] |
| z_p (NEXT) | [ 8 8 8 8; 0 0 0 0 ; 0 0 0 0 ; 0 0 0 0 ] | mm | [test cases] |
| z_p (FEXT) | [ 8 24 30 45 ; 1 1 1 1 ; 1 1 1 1 ; 0.5 0.5 0.5 0.5 ] | mm | [test cases] |
| z_p (RX) | [ 8 8 8 8; 0 0 0 0 ; 0 0 0 0 ; 0 0 0 0 ] | mm | [test cases] |
| C_p | [0.4e-4 0.4e-4] | nF | [TX RX] |
| **Filter: Rx FFE** | | | |
| ffe_pre_tap_len | **6** | UI | |
| ffe_post_tap_len | 25 | UI | |
| ffe_tap_step_size | 0 | | |
| ffe_main_cursor_min | 0.7 | | |
| ffe_pre_tap1_max | 0.7 | | |
| ffe_post_tap1_max | 0.7 | | |
| ffe_tapn_max | 0.7 | | |
| **Operational** | | | |
| ERL Pass threshold | 10 | dB | |
| COM Pass threshold | 3 | db | |
| VEC Pass threshold | 10 | db | |
| DER_0 | 2.00E-05 | | |
| T_r | 4.00E-03 | ns | |
| FORCE_TR | 1 | logical | |
| Min_VEO_Test | 0 | mV | |
| PMD_type | C2C | | |
| EH_min | 5 | Value | |
| EH_max | 1000 | Value | |
| T_O | 50 | mUI | |
| samples_for_C2M | 100 | samples/UI | |
| ts_anchor | 1 | | |
| sample_adjustment | [ -8 12 ] | | |
| EW | 1 | | |
| MLSE | 0 | | |
| Local Search | 2 | | |

| | | |
|---|---|---|
| SAVE_CONFIG2MAT | 0 | |
| **Receiver testing** | | |
| RX_CALIBRATION | 0 | logical |
| Sigma BBN step | 5.00E-03 | V |
| **ICN parameters** | | |
| f_v | 0.588 | Fb |
| f_f | 0.278 | Fb |
| f_n | 0.278 | Fb |
| f_2 | 61.625 | GHz |
| A_ft | 0.450 | V |
| **A_nt** | 0.450 | V |

| **Parameter** | **Setting** | |
|---|---|---|
| board_tl_gamma0_a1_a2 | *[0 6.44084e-4 3.6036e-05]* | 1.4 db/in @ 53.125G |
| board_tl_tau | *5.790E-03* | ns/mm |
| board_Z_c | 100 | Ohm |
| z_bp (TX) | *32* | mm |
| z_bp (NEXT) | *32* | mm |
| z_bp (FEXT) | *32* | mm |
| z_bp (RX) | *32* | mm |
| C_0 | [0.2e-4 0] | nF |
| C_1 | [0.2e-4 0] | nF |
| **Include PCB** | **0** | **logical** |
| **Seletions (rectangle, gaussian,dual_rayleigh,triangle** | | |
| Histogram_Window_Weigh | gaussian | selection |
| Qr | *0.02* | UI |
| **Floating Tap Control** | | |
| N_bg | **0** | 0 1 2 or 3 groups |
| N_bf | 4 | taps per group |
| N_f | 80 | UI span for floating taps |
| bmaxg | 0.2 | max DFE value for floating taps |
| B_float_RSS_MAX | 0.1 | rss tail tap limit |
| N_tail_start | 16 | (UI) start of tail taps limit |

| |
|---|
| benartsi_3df_01a_2211 |
| mli_3df_02_220316 |
| ran_3dj_elec_02_230622 |

# Results of Sweep 1&2 for C2M channels

- ✓ Used 26 C2M channels selected in lusted_3dj_02a_2309, slide 12

- ❖ Sweeping only $\sigma_{RJ}$ degrades COM only moderately
- ❖ Sweeping $\sigma_{RJ}$ and $A_{DD}$ results in larger COM degradation