

NJN-Korrelatoren

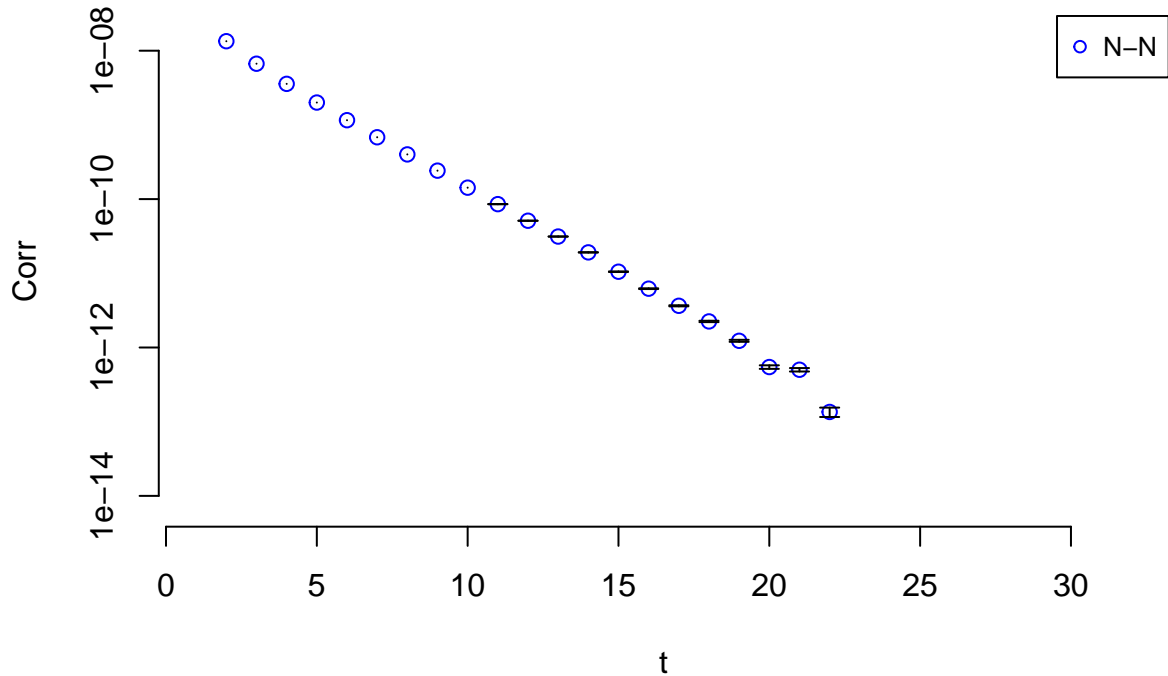
Timo Beilschmidt

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NN-Correlator

```
## [1] "N-N, T=64, n_src=16, n_conf=52, Gi = Gi_Cg5gt, Gf = Gf_Cg5gt"
## [1] "Symmetrized:"
## [1] -5.263089e-09  1.342494e-08  6.680684e-09  3.574597e-09  2.002010e-09
## [6]  1.157457e-09  6.816264e-10  4.004103e-10  2.418247e-10  1.425746e-10
## [11]  8.548801e-11  5.111694e-11  3.129150e-11  1.914125e-11  1.050606e-11
## [16]  6.204907e-12  3.646169e-12  2.245112e-12  1.230222e-12  5.450018e-13
## [21]  5.014849e-13  1.352102e-13 -3.329118e-16 -8.137589e-14 -1.173848e-13
## [26] -9.507969e-14 -2.576958e-14 -1.025189e-13 -8.087892e-14 -4.376005e-14
## [31] -5.800247e-14 -9.127010e-15 -1.293427e-14 -1.555794e-14 -3.269643e-14
## [36] -6.208327e-14 -4.456083e-14  6.916324e-15  3.105809e-14 -2.326185e-14
## [41]  2.065029e-14  3.709208e-14  3.454967e-14 -2.500308e-14 -7.657407e-14
## [46] -1.471450e-13 -1.812902e-13 -1.841362e-13 -8.442682e-14 -3.191316e-13
## [51] -1.709732e-13  3.922412e-13  4.970998e-13  1.484360e-12  3.538151e-12
## [56]  6.871682e-12  1.475798e-11  2.921650e-11  6.409887e-11  1.428875e-10
## [61]  3.422838e-10  8.992334e-10  2.557055e-09  1.634944e-08
```

N-N Correlator

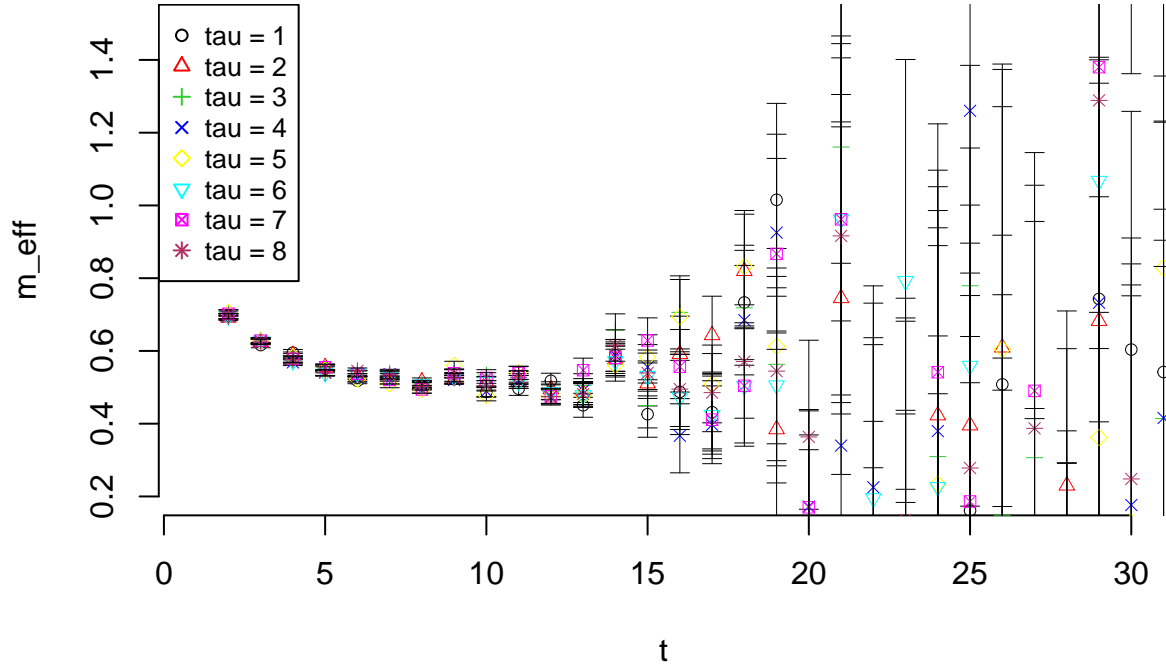


Effective Mass

We calculate the effective mass following <https://arxiv.org/abs/1612.06963>.

$$m^{eff}(t, \tau) = \frac{1}{\tau} \ln \left(\frac{C(t)}{C(t+\tau)} \right) \rightarrow_{t \rightarrow \infty} \frac{1}{\tau} \ln(e^{E_0 \tau}) = E_0$$

N-N Correlator effective mass

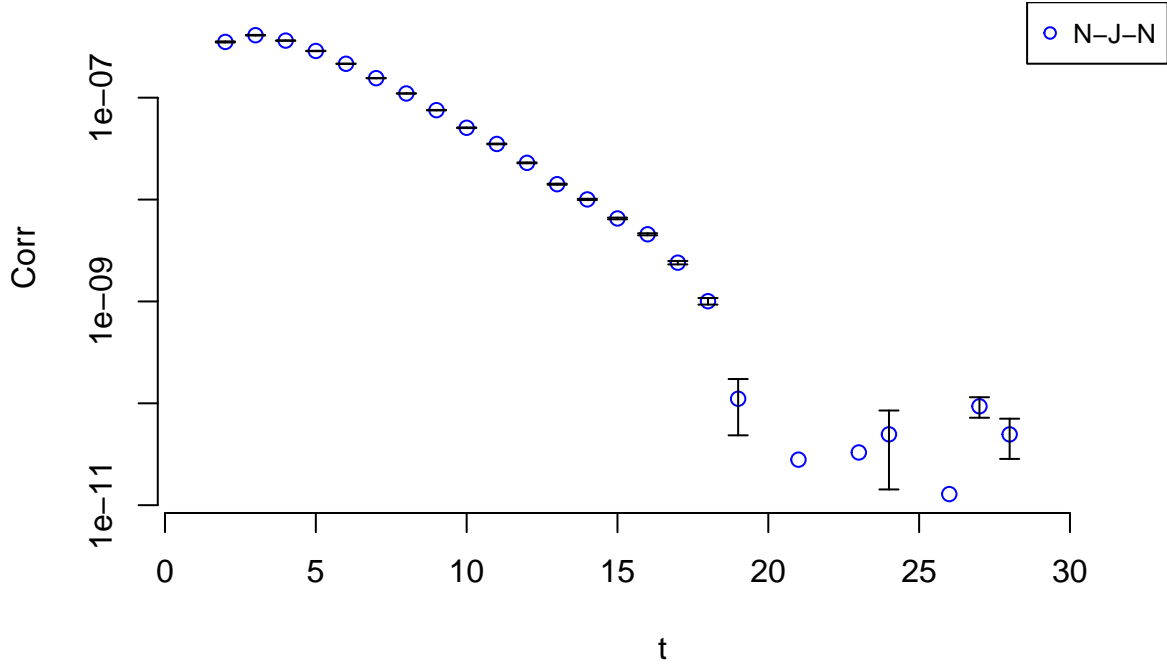


NJN-Correlator

First the 3pt-function correlator:

```
## [1] "N-J-N, T=64, n_src=16, n_conf=52, Gi = Gi_Cg5gt, Gf = Gf_Cg5gt"
## [1] "Symmetrized:"
## [1] -1.878429e-07  3.527035e-07  4.105506e-07  3.634870e-07  2.875087e-07
## [6]  2.152937e-07  1.555487e-07  1.100326e-07  7.542379e-08  5.068947e-08
## [11]  3.514744e-08  2.293536e-08  1.415576e-08  1.003578e-08  6.525015e-09
## [16]  4.562794e-09  2.402439e-09  1.005561e-09  1.108351e-10 -3.512737e-11
## [21]  2.797372e-11 -2.930776e-10  3.292029e-11  4.961927e-11 -5.054414e-11
## [26]  1.285237e-11  9.344241e-11  4.954832e-11 -2.731457e-11 -6.977694e-11
## [31] -1.114514e-10 -1.367227e-10 -9.908533e-11 -1.173011e-10 -1.574097e-10
## [36] -4.459261e-11  3.899846e-11 -1.630353e-10 -1.652079e-10 -6.671210e-11
## [41] -6.780158e-11 -1.524821e-10  2.969911e-10  3.853345e-10  4.140481e-10
## [46]  4.073492e-10  1.069840e-10  7.835085e-10  4.305285e-10  5.941536e-10
## [51]  3.654188e-10  7.466623e-10  8.873875e-10  2.209112e-09  2.990080e-09
## [56]  5.460322e-09  1.097093e-08  1.836923e-08  3.199812e-08  5.958482e-08
## [61]  1.080306e-07  1.975960e-07  3.818178e-07  5.637172e-07
```

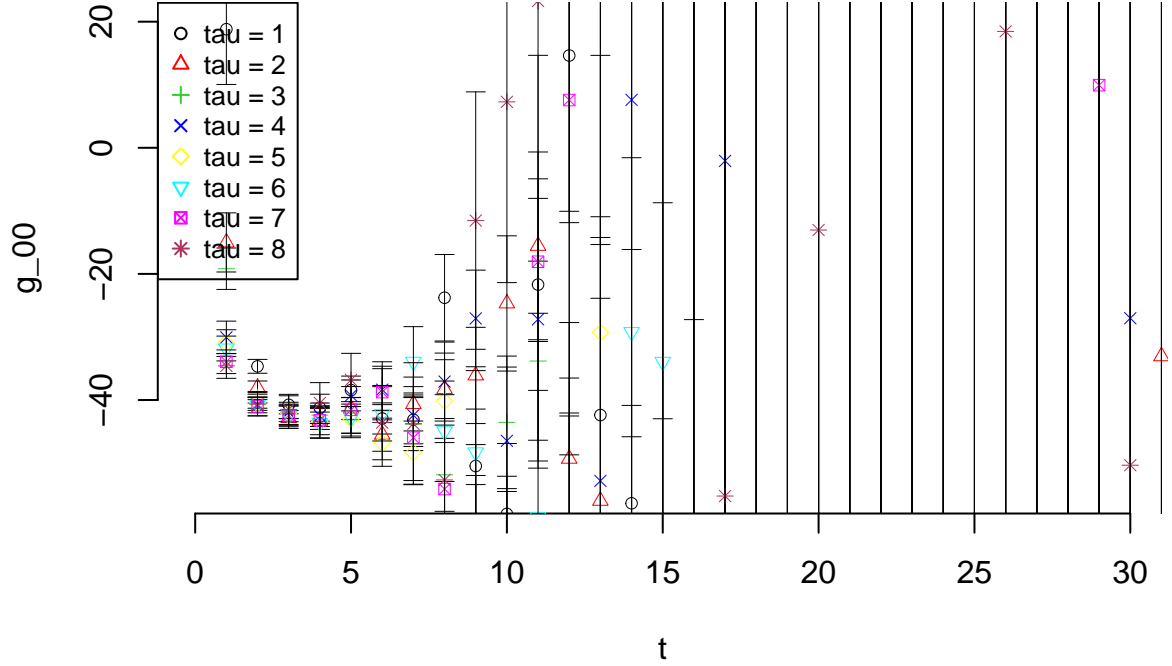
3pt-function Correlator



Ratio-Plot

$$\left. \frac{\partial m_{\lambda}^{eff}(t, \tau)}{\partial \lambda} \right|_{\lambda=0} = \frac{1}{\tau} \left(\frac{\partial_{\lambda} C_{\lambda}(t)}{C(t)} - \frac{\partial_{\lambda} C_{\lambda}(t+\tau)}{C(t+\tau)} \right)_{\lambda=0}$$

N-J-N linear response of effective mass to external bilinear current



## [1] "tau = 1"					
## [1]	18.80974	-34.65756	-40.76115	-41.21405	-38.42931
## [6]	-42.92478	-43.12660	-23.78204	-50.46930	-58.06235
## [11]	-21.69523	14.63249	-42.38689	-56.38159	-157.62016
## [16]	-192.69994	370.37823	240.29800	311.28926	-1126.76216
## [21]	231.96654	-352805.34934	363550.75463	-9524.63212	5340.13207
## [26]	-11431.48250	13205.05278	-7634.02347	7075.69906	-13290.52968
## [31]	62343.20413	-46277.88803	81785.10144	-105783.39341	11408.57520
## [36]	1448.90143	16681.82212	-11373.83695	-9638.59473	11322.56078
## [41]	77618.99002	-75704.79971	-2698.29355	-1107.40099	4683.07539
## [46]	-7938.09858	3572.23405	562.33139	-2164.03272	-18793.40924
## [51]	15230.80233	527.09394	-592.66149	310.42571	23.63231
## [56]	41.22222	217.22439	80.53689	119.90330	103.43813
## [61]	99.37799	81.29831	116.17381	NA	
## [1] "tau = 2"					
## [1]	-15.00614	-38.03306	-42.84110	-43.28637	-41.34914
## [6]	-45.49935	-40.63432	-38.26841	-36.10133	-24.68327
## [11]	-15.54973	-49.31300	-55.98732	-123.04259	-78.39246
## [16]	180.68343	44.62178	-66.66956	35.80034	-371.17219
## [21]	-5823.59851	-896.82960	3336.63172	1586.76097	4063.14514
## [26]	55.73850	-1430.09117	-985.83329	-389.45216	-88.32955
## [31]	-33.05842	833.38629	463.84785	179.15588	-5174.97284
## [36]	4719.04341	9721.27984	-20179.85663	-3357.19290	16147.95944
## [41]	-1818.96363	25252.27520	3099.65774	-24434.72957	-1359.52359
## [46]	-583.35017	-602.97902	2455.89365	-8093.51694	-4127.80097

```

## [51] 7015.03122 -151.72202 208.59591 464.57574 33.45331
## [56] 68.24953 182.68442 125.29665 64.85764 83.77362
## [61] 79.26487 90.01813 NA
## [1] "tau = 3"
## [1] -1.917709e+01 -3.956935e+01 -4.193581e+01 -4.238954e+01 -4.315320e+01
## [6] -3.768820e+01 -4.382127e+01 -5.186506e+01 -6.119044e+01 -4.354238e+01
## [11] -3.382166e+01 -6.592442e+01 -1.496321e+02 -9.144351e+01 2.813730e+01
## [16] 9.729135e+01 3.661069e+02 3.734224e+02 8.539743e+02 -1.042469e+03
## [21] 1.787680e+06 -8.797288e+02 7.615548e+02 -1.787857e+06 7.753959e+01
## [26] -1.507150e+02 -7.275708e+02 -6.043354e+02 -1.199145e+03 1.236397e+04
## [31] 4.419629e+04 -3.854730e+02 -1.250759e+04 -4.329259e+04 2.331382e+03
## [36] 1.810647e+00 2.283178e+03 -9.074021e+02 -3.455240e+02 -2.765148e+04
## [41] -3.932747e+03 3.876759e+03 2.686051e+04 5.772883e+03 3.782773e+03
## [46] -6.270332e+02 -5.831184e+02 -5.011664e+03 -1.609937e+03 -1.459922e+03
## [51] -1.818705e+03 2.943801e+02 4.529363e+02 1.074589e+02 9.526434e+01
## [56] 7.319487e+01 1.464081e+02 1.115453e+02 9.815914e+01 8.425169e+01
## [61] 9.551793e+01 NA
## [1] "tau = 4"
## [1] -30.069425 -40.790959 -41.952610 -42.553890 -39.274074
## [6] -38.358154 -42.412326 -37.074398 -27.064134 -46.475653
## [11] -27.198723 -68.792722 -52.826259 7.595774 152.948642
## [16] 196.785248 -2.070160 372.323281 -4481.234004 -933.453026
## [21] -415.020310 -455.083008 4260.445016 1209.071748 479.881656
## [26] -218.216405 124.368149 -941.279730 2010.448623 -27.026438
## [31] -1011.142734 1216.174491 -1389.340444 -2405.872280 4461.597711
## [36] -6329.481443 327.298128 3304.553353 -3257.378788 5589.445493
## [41] -347.416976 835.654364 -224.113195 800.689714 -218.510648
## [46] -1233.720207 -118.845383 -872.166748 -75.325067 -168.846142
## [51] 60.735909 61.958005 -405.478758 -29.800026 37.021076
## [56] 72.181079 112.802331 93.869910 84.877338 97.257675
## [61] NA
## [1] "tau = 5"
## [1] -30.97276 -40.42899 -42.11239 -43.43241 -42.99048
## [6] -46.82849 -48.34375 -40.18162 -61.24645 -70.31021
## [11] -87.27715 -68.37181 -29.27630 61.87347 213.78650
## [16] 384.47312 -1931.50159 -1216.42889 -148.69078 562.25530
## [21] 1450.73917 -7611.08579 1459.38690 569.21201 29.42525
## [26] -1171.81749 8582.86188 294.81979 -325.09485 -852.17042
## [31] -530.63893 1366.22129 -739.45967 -148.71824 -48935.90044
## [36] 1365.55588 902.88844 -1454.02326 -687.96765 56096.77455
## [41] -886.15434 -567.78347 2047.85581 1783.61518 -6407.68472
## [46] 955.46954 -916.38477 -1607.30675 -1449.42673 -765.15370
## [51] -1578.01871 184.89438 1210.21723 375.12631 118.39769
## [56] 118.31892 109.79236 100.06805 88.52137 NA
## [1] "tau = 6"
## [1] -31.83053 -40.82455 -42.44337 -43.62864 -42.77935
## [6] -42.19431 -33.92960 -44.95731 -48.29969 -79.35579
## [11] -58.55973 25.32961 50.36697 -29.22481 -33.94547
## [16] 118.67399 -357.93481 -677.62771 68.58495 16593.69738
## [21] 928.30957 1566.25198 302.45434 138.00198 -832.00204
## [26] -15703.76046 17221.19966 86.88903 -1009.08853 537.39376
## [31] 881.09814 -4738.25530 4107.00734 1544.54822 982.67562
## [36] 175.48718 -252.31022 4555.13325 -22053.80141 -3004.86437
## [41] 133.48905 66.86378 -279.47036 -541.55482 -153.05948

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## [46] 271.20853 156.55724 -409.28028 282.62596 -225.06781
## [51] -72.05068 -545.91422 -163.42761 151.92405 103.47143
## [56] 143.68601 132.51609 96.49702 NA
## [1] "tau = 7"
## [1] -33.933118 -41.019212 -42.432698 -43.239281 -41.559387
## [6] -38.746146 -45.985632 -54.115440 -62.554538 -75.496853
## [11] -18.071123 7.575153 24.495145 30.646830 187.030088
## [16] -301.323371 1053.876505 52.137852 278.451767 -1070.528744
## [21] 308.421813 -76.100388 -157.423109 -947.669384 -1186.237383
## [26] -839.898419 602.380476 -653.401006 9.935791 833.535303
## [31] 741.384979 1840.809010 -1181.832910 758.856936 550.911697
## [36] -365.892378 -4701.043858 -419.052147 -431.934687 1787.848460
## [41] 198.046774 1010.243065 641.973516 5095.447810 -551.448631
## [46] -340.689231 -202.014380 -572.991317 -1272.040649 -407.984398
## [51] -748.045020 178.425274 83.410473 167.167624 93.041784
## [56] 81.987360 99.745815 NA
## [1] "tau = 8"
## [1] -34.588282 -40.665552 -41.493998 -40.467393 -36.819929
## [6] -43.587638 -43.758462 -52.677043 -11.542140 7.288447
## [11] 23.284274 43.483145 71.205772 213.282801 135.389731
## [16] 9320.282634 -55.231285 -65.746065 201.809654 -13.036351
## [21] -473.290263 -404.765880 -256.150697 -9580.259496 -3418.478446
## [26] 18.459492 -251.504327 781.630542 848.546422 -50.340198
## [31] 1488.677397 128.367751 3370.611391 -545.640874 3054.635784
## [36] -273.152490 -1240.919639 -540.270120 -1360.477268 809.476423
## [41] 290.385524 -5824.365890 -3117.991981 -598.857002 715.743570
## [46] 709.926451 -74.433835 -689.860290 -250.362949 6353.137943
## [51] 71.340868 59.662926 92.369692 110.546804 119.991352
## [56] 95.260590 NA

```