

NJN-Korrelatoren

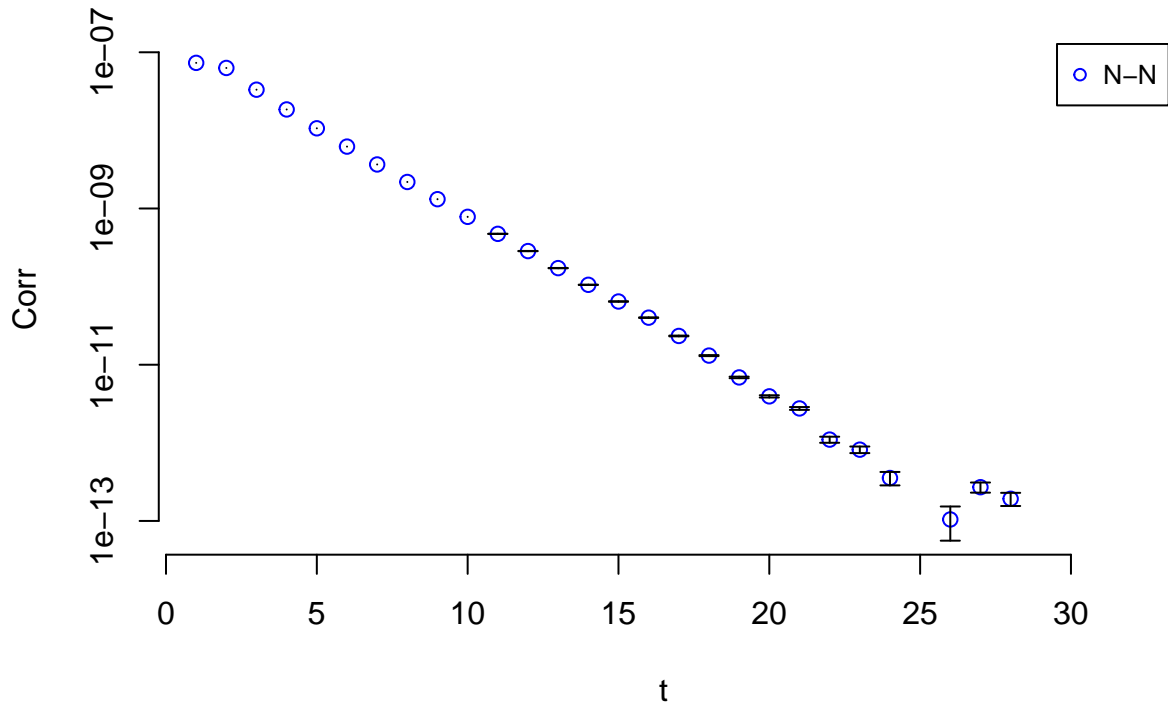
Timo Beilschmidt

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NN-Correlator

```
## [1] "N-N, T=64, n_src=16, n_conf=52, Gi = Gi_Cg5, Gf = Gf_Cg5"
## [1] "Symmetrized:"
## [1] 7.318946e-08 6.299467e-08 3.320306e-08 1.853600e-08 1.063232e-08
## [6] 6.203673e-09 3.663519e-09 2.185815e-09 1.316630e-09 7.819695e-10
## [11] 4.738550e-10 2.851451e-10 1.724995e-10 1.054593e-10 6.446019e-11
## [16] 4.004566e-11 2.334636e-11 1.308640e-11 6.878263e-12 3.933825e-12
## [21] 2.756815e-12 1.099665e-12 8.177935e-13 3.543506e-13 -3.784554e-14
## [26] 1.044617e-13 2.703294e-13 1.921003e-13 -2.754101e-14 -1.349661e-13
## [31] -1.590867e-13 -1.752276e-13 -9.679159e-14 -1.045205e-13 -1.842510e-13
## [36] -2.658052e-14 8.764071e-14 -2.275078e-13 -2.389953e-13 -9.586949e-14
## [41] -1.300505e-13 -3.400253e-13 3.682169e-13 6.289728e-13 8.838504e-13
## [46] 9.461913e-13 6.460016e-14 1.793370e-12 1.866780e-12 2.453737e-12
## [51] 2.965058e-12 5.736935e-12 9.311356e-12 1.680477e-11 3.090208e-11
## [56] 6.198888e-11 1.301896e-10 2.605358e-10 5.408019e-10 1.157183e-09
## [61] 2.550776e-09 5.919643e-09 1.474232e-08 -2.093002e-08
```

N-N Correlator

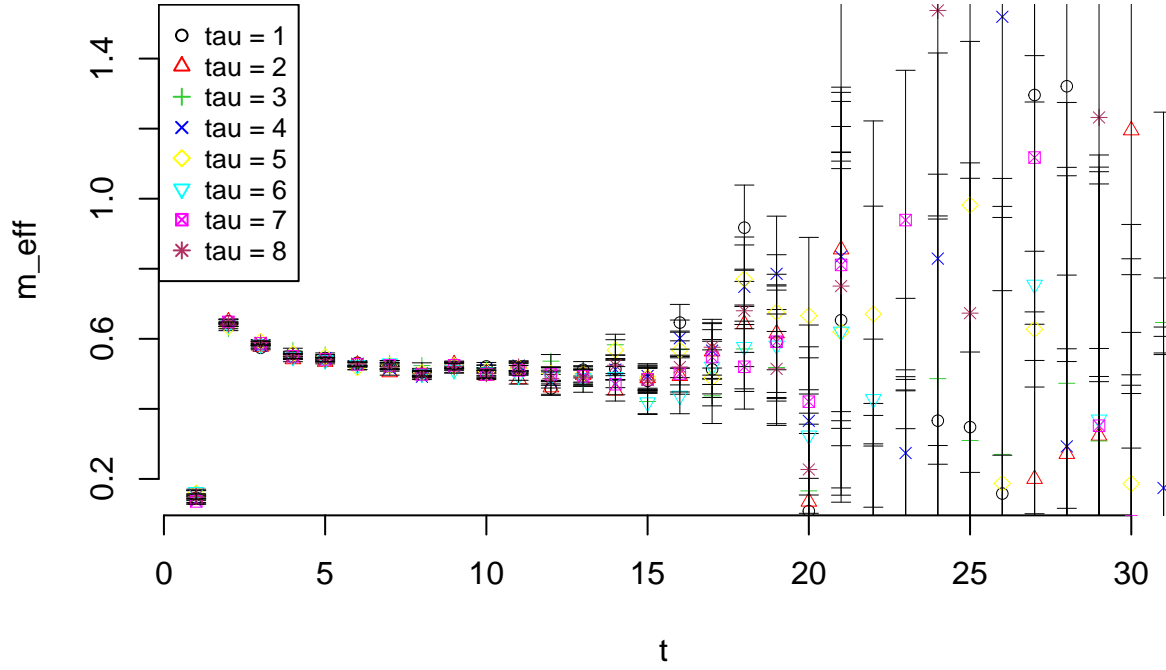


Effective Mass

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

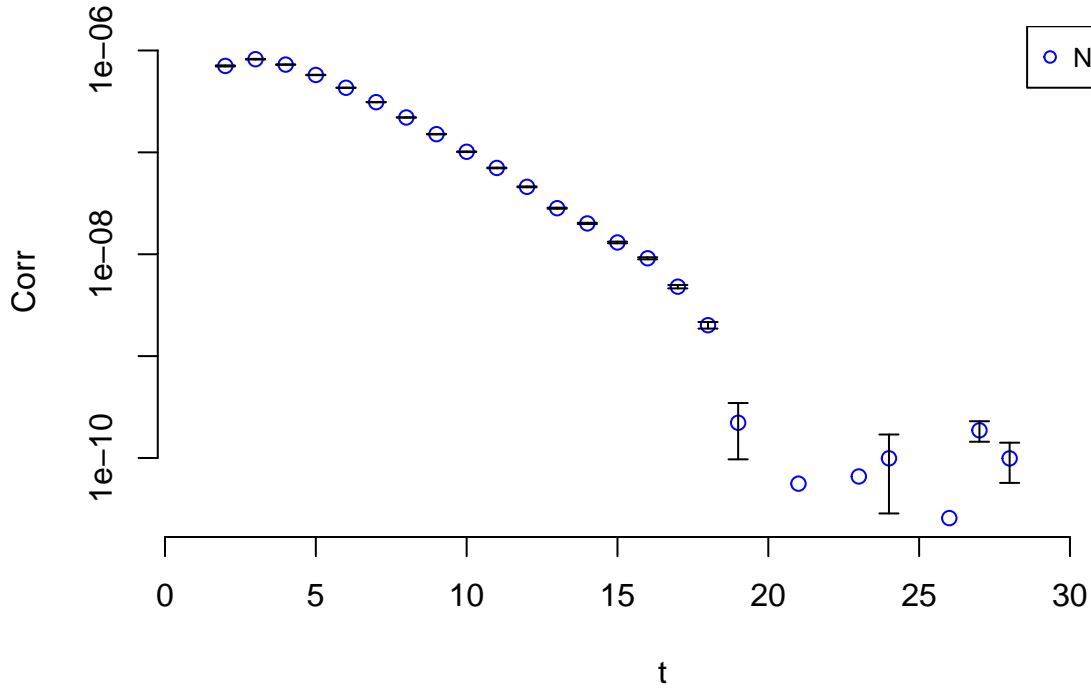


NJN-Correlator

First the 3pt-function correlator:

```
## [1] "N-J-N, T=64, n_src=16, n_conf=52, Gi = Gi_Cg5, Gf = Gf_Cg5"
## [1] "Symmetrized:"
## [1] -3.756859e-07  7.054070e-07  8.211011e-07  7.269740e-07  5.750175e-07
## [6]  4.305873e-07  3.110973e-07  2.200651e-07  1.508476e-07  1.013789e-07
## [11]  7.029487e-08  4.587072e-08  2.831153e-08  2.007156e-08  1.305003e-08
## [16]  9.125588e-09  4.804877e-09  2.011122e-09  2.216702e-10 -7.025474e-11
## [21]  5.594744e-11 -5.861553e-10  6.584058e-11  9.923854e-11 -1.010883e-10
## [26]  2.570475e-11  1.868848e-10  9.909665e-11 -5.462913e-11 -1.395539e-10
## [31] -2.229027e-10 -2.734455e-10 -1.981707e-10 -2.346022e-10 -3.148194e-10
## [36] -8.918522e-11  7.799691e-11 -3.260705e-10 -3.304158e-10 -1.334242e-10
## [41] -1.356032e-10 -3.049641e-10  5.939823e-10  7.706690e-10  8.280962e-10
## [46]  8.146984e-10  2.139680e-10  1.567017e-09  8.610569e-10  1.188307e-09
## [51]  7.308376e-10  1.493325e-09  1.774775e-09  4.418224e-09  5.980160e-09
## [56]  1.092064e-08  2.194186e-08  3.673845e-08  6.399624e-08  1.191696e-07
## [61]  2.160612e-07  3.951920e-07  7.636357e-07  1.127434e-06
```

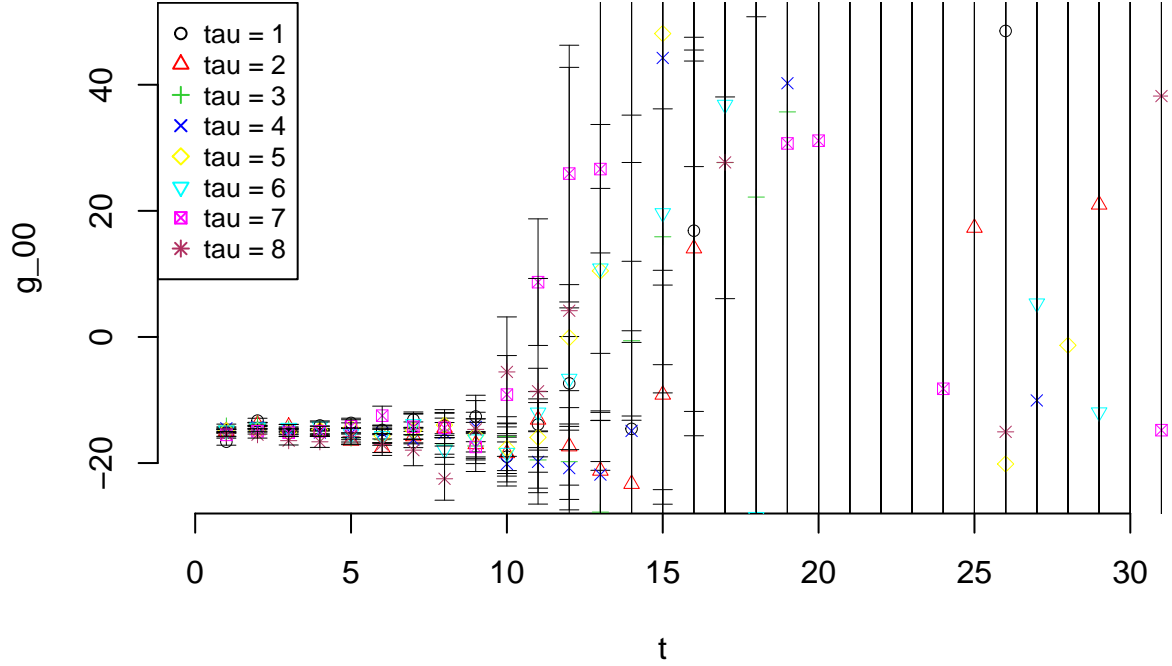
3pt-function Correlator



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]	-16.608909	-13.263486	-14.913239	-14.040770
## [6]	-14.754996	-13.113404	-14.054794	-12.614319
## [11]	-13.885224	-7.359572	-30.191575	-14.576276
## [16]	16.849306	56.037415	159.182507	103.083522
## [21]	285.041307	-548.119099	63.658806	-287.024344
## [26]	48.529924	97.670636	-388.334480	90.850087
## [31]	-6763.675554	7161.220358	-11496.860500	10638.175900
## [36]	609.392707	85.620301	-146.673507	-88.957443
## [41]	-85.400776	270.666688	706.619749	-330.691790
## [46]	63.487062	-200.277677	444.754137	-216.657221
## [51]	-22.114327	42.411478	-25.516000	46.565270
## [56]	10.453531	34.269207	28.643751	15.855565
## [61]	15.964223	15.348988	108.898254	NA
## [1] "tau = 2"				
## [1]	-1.492529e+01	-1.388423e+01	-1.423160e+01	-1.497181e+01
## [6]	-1.756292e+01	-1.575729e+01	-1.441440e+01	-1.700729e+01
## [11]	-1.311026e+01	-1.735408e+01	-2.121052e+01	-2.331051e+01
## [16]	1.404450e+01	9.813086e+01	2.105223e+02	1.183778e+02
## [21]	7.251668e+02	-2.546045e+03	-1.228926e+03	-3.453281e+02
## [26]	9.433506e+02	-3.499010e+02	-5.374353e+02	2.099423e+01
## [31]	5.882682e+02	1.875695e+03	-1.695359e+03	-3.533936e+02
## [36]	-2.227880e+02	-5.463711e+02	-2.956076e+02	5.416841e+02
## [41]	1.652129e+03	7.637242e+04	-1.699374e+03	-7.628323e+04
## [46]	-2.568086e+01	3.324012e+02	5.100631e+02	-3.270734e+01

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## [51] -2.475043e+01  1.647542e+01 -3.030455e+01  5.007181e+00 -1.939792e+01
## [56]  6.198512e-01  2.198732e+01  2.161417e+01  1.738882e+01  2.040831e+01
## [61]  1.712474e+01  5.781817e+01                NA
## [1] "tau = 3"
## [1] -14.1193185 -13.8402219 -14.5999783 -15.3037015 -16.0316977
## [6] -16.3033731 -15.5888770 -16.9708187 -17.2930686 -15.7922273
## [11] -19.5034070 -19.7838989 -27.7793580 -0.6044143  15.8894190
## [16]  90.3949590  27.6550467  22.1855882  35.6946071  82.9455583
## [21] 2858.8443622 -437.2495646 -532.3662987 -3125.5227717  126.3968842
## [26] -31.7735781 -248.0724223 -197.1040039 -36.1400203 -496.3540085
## [31] -574.6989470  41.1416487 1187.2145596 1146.7530904  82.0816194
## [36] -537.0873171 -522.8616483  133.6570905  117.9213289 1067.6046506
## [41]  482.8943096  43.3750202 -863.0488101 -386.3643985 -65.2884760
## [46]  28.4701120  88.7290653  256.5023262  150.8422631  106.3450259
## [51] -21.4064337 -16.7647574 -56.4550266  14.2755105  5.4525071
## [56]  27.6699607  19.0335322  18.5704053  18.2109508  16.7199633
## [61]  45.7768521                NA
## [1] "tau = 4"
## [1] -14.490800 -14.308839 -14.803199 -15.168027 -15.255142
## [6] -15.226201 -16.261510 -15.233872 -14.275070 -20.147048
## [11] -19.801905 -20.801345 -21.831063 -14.901493  44.250710
## [16]  90.667306  80.434482  541.203782  40.239671 -1338.080128
## [21] -297.822615 -862.246802 -270.282306 1079.292672 -35.786983
## [26] -36.712220 -10.065844  244.089560  175.435572 1150.301390
## [31] -369.669935 -715.963297  13.887096 -318.907696  219.598433
## [36]  356.297048 -252.257434 -794.989708  77.223869  107.246836
## [41]  225.956304  308.302638  126.019817  38.024447  165.955724
## [46]  52.868654  252.484748  185.022080  3.895693 -11.167815
## [51] -90.003449 -29.820955 -59.508334  1.251915  6.875256
## [56]  17.451925  22.595399  20.762859  17.232101  41.398358
## [61]                NA
## [1] "tau = 5"
## [1] -14.9080983 -14.8262642 -15.0925378 -14.7410806 -14.4304194
## [6] -15.7089623 -14.8301535 -13.9680882 -15.6124158 -17.6561747
## [11] -15.9295647 -0.1085487  10.4786849  62.1251517  48.1161976
## [16]  60.6449340  292.1246446 -32.7656842 -153.3789878 -210.5525502
## [21] -228.4759028 -430.5788072 -136.7684510  58.2625394 -227.6081460
## [26] -20.1456412 -80.6115855 -1.3237511 -65.8334534  776.6200550
## [31]  86.3344419  59.5041797 -223.1303176 -135.5339349 -523.9331665
## [36] -2198.9579635 -39.6994769  111.1799175  47.4972377  41.7012625
## [41]  2227.0325406  126.3970998  162.6419582  188.5380069  120.9373816
## [46]  159.6098672  50.3796236  115.6356875  8.3050264 -19.9854419
## [51] -79.8121911  20.1078177  1.1781935  3.9033012  16.9691335
## [56]  22.6425878  21.5745651  16.8142864  34.2857355                NA
## [1] "tau = 6"
## [1] -14.834274 -14.355661 -14.406555 -14.195626 -15.398308
## [6] -15.731345 -13.827191 -17.904218 -16.242623 -18.376393
## [11] -11.991566 -6.626921  10.867510  71.785066  19.631069
## [16]  81.105380  36.827317 -28.542557 -70.554236 -126.318147
## [21] -111.856746 -153.033429 -207.407522 -172.722216 -50.591533
## [26] -622.966876  5.319476 -147.861296 -11.956377 -122.824765
## [31] -177.982973  431.076500 -128.761690 -36.094426  87.930603
## [36]  222.616047 -86.255585  91.665561  63.740255  117.396434
## [41] -124.691518 -58.179467  292.348282  87.175750  106.048911

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## [46] 96.501621 266.069865 163.429917 90.792615 72.737582
## [51] 51.155946 58.562853 -29.530639 13.094501 5.177829
## [56] 17.890187 21.012659 30.899591 NA
## [1] "tau = 7"
## [1] -15.528023 -14.947614 -15.179915 -14.977954 -14.165767
## [6] -12.480610 -14.244975 -14.413405 -17.444182 -9.139868
## [11] 8.690783 25.909083 26.624738 59.433886 64.442693
## [16] 56.223873 -87.311489 184.251020 30.691355 31.128335
## [21] -87.202643 -163.633721 -162.437533 -8.219975 -303.846988
## [26] -282.363771 -182.307157 -126.692868 -53.374088 -77.610149
## [31] -14.782604 -88.760374 203.355371 50.835163 189.544572
## [36] -5.237889 43.092686 -20.701978 69.638896 724.082320
## [41] 5.739490 -46.645602 119.480212 207.089064 136.960974
## [46] 118.358109 -728.471467 59.724397 13.070550 43.497244
## [51] -53.073996 5.692730 17.648821 36.768786 21.282409
## [56] 17.722372 31.687688 NA
## [1] "tau = 8"
## [1] -15.3714280 -15.5044339 -16.4460531 -16.6293532 -15.7677009
## [6] -17.0454135 -17.9520087 -22.4944548 -14.6625441 -5.5451794
## [11] -8.6134444 4.1623934 100.0635634 373.2207218 -2429.3416657
## [16] -166.3362816 27.6819263 112.7180626 -76.9045593 -285.5579661
## [21] -455.1852325 -606.1405326 2269.0247732 -160.7114257 65.2080022
## [26] -15.0511648 620.8656847 212.8765571 252.3725409 152.6640821
## [31] 38.2055171 199.8718538 -217.0822302 -183.3767907 -697.4976776
## [36] -81.4375300 0.7180767 -26.5194597 177.9757134 55.2590157
## [41] 509.9835727 134.0059678 -3851.8364867 225.3543624 106.8457906
## [46] 95.1103663 -50.9394912 83.6642144 -378.4182809 -44.9387689
## [51] 4019.0048542 -65.6826833 7.6468252 29.6041203 17.5418408
## [56] 30.4390709 NA

```