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# Experimental condition

| | |
|---|---|
| **Type of tomography** | StandardQst |
| **Nrep** | 100 |
| **N** | [100, 1000, 10000] |
| **RNG seed** | 777 |

## True object

| | |
|---|---|
| **Type** | State |
| **Dim** | 2 |
| **Vec** | [0.70710678 0.40824829 0.40824829 0.40824829] |

## Tester objects

| | | |
|---|---|---|
| **0** | **Type** | Povm |
| | **Dim** | 2 |
| | **Number of outcomes** | 2 |
| | **Vecs** | [0.70710678 0.70710678 0. 0. ]<br>[ 0.70710678 -0.70710678 0. 0. ] |
| **1** | **Type** | Povm |
| | **Dim** | 2 |
| | **Number of outcomes** | 2 |
| | **Vecs** | [0.70710678 0. 0.70710678 0. ]<br>[ 0.70710678 0. -0.70710678 0. ] |
| **2** | **Type** | Povm |
| | **Dim** | 2 |
| | **Number of outcomes** | 2 |
| | **Vecs** | [0.70710678 0. 0. 0.70710678]<br>[ 0.70710678 0. 0. -0.70710678] |

## Cases

| | Name | Parameterization | Tomography | Estimator |
|---|---|---|---|---|
| **0** | LinearEstimator(True) | True | StandardQst | LinearEstimator |

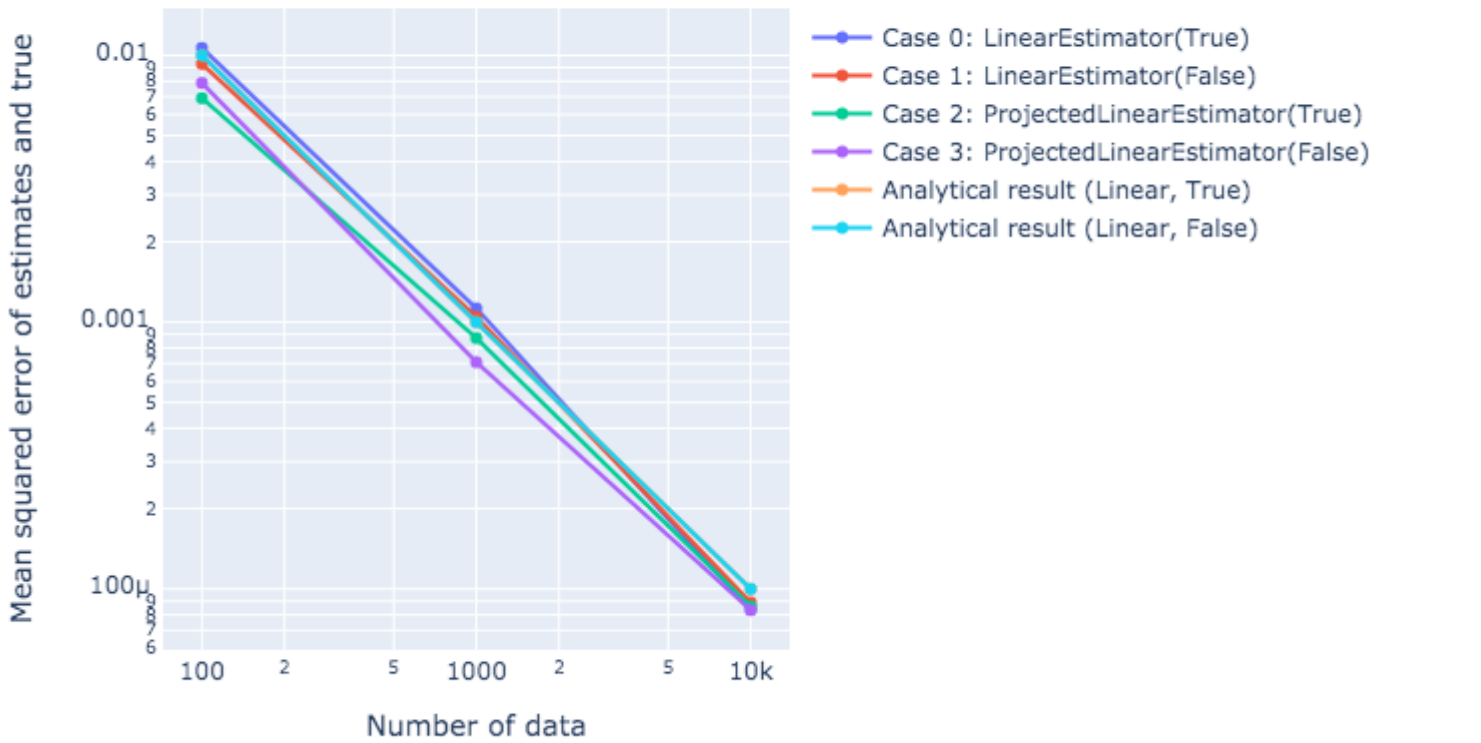| | | | | |
|---|---|---|---|---|
| **1** | LinearEstimator(False) | False | StandardQst | LinearEstimator |
| **2** | ProjectedLinearEstimator(True) | True | StandardQst | ProjectedLinearEstimator |
| **3** | ProjectedLinearEstimator(False) | False | StandardQst | ProjectedLinearEstimator |

# MSE of Empirical Distributions
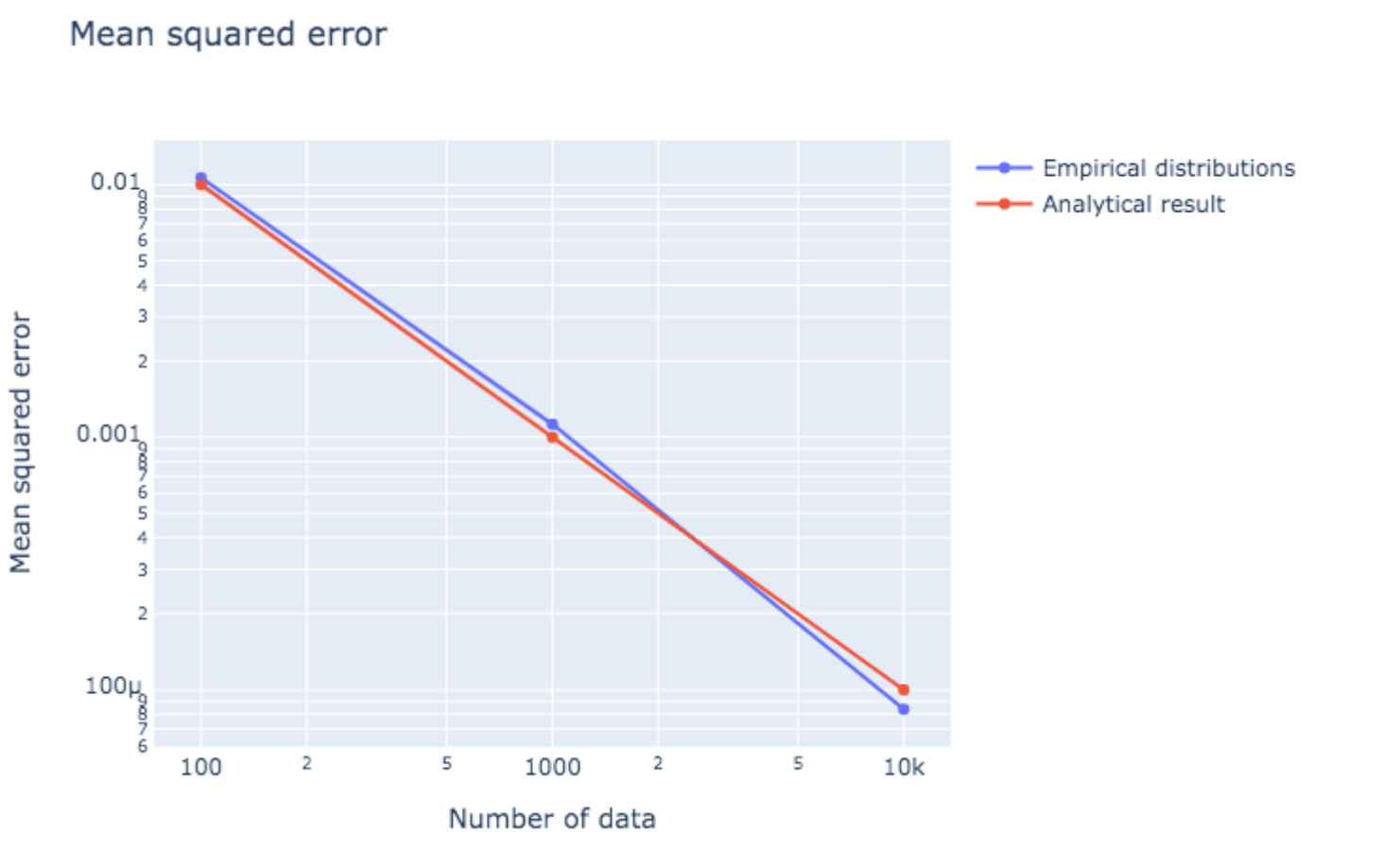


# Consistency test

| | Type of tomography | Parametorization | Estimator | Result |
|---|---|---|---|---|
| | | | | |

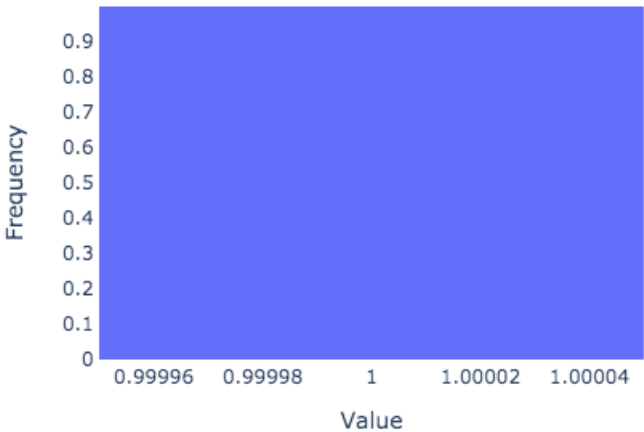| | | | | |
|---|---|---|---|---|
| **0** | StandardQst | True | LinearEstimator | 9.244464e-33 |
| **1** | StandardQst | False | LinearEstimator | 5.854827e-32 |
| **2** | StandardQst | True | ProjectedLinearEstimator | 2.095412e-31 |
| **3** | StandardQst | False | ProjectedLinearEstimator | 3.050673e-31 |

# MSE



# Physicality violation test

# on_para_eq_constraint=True

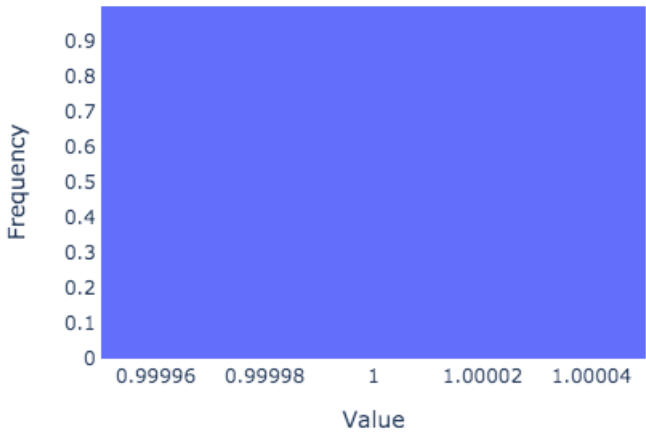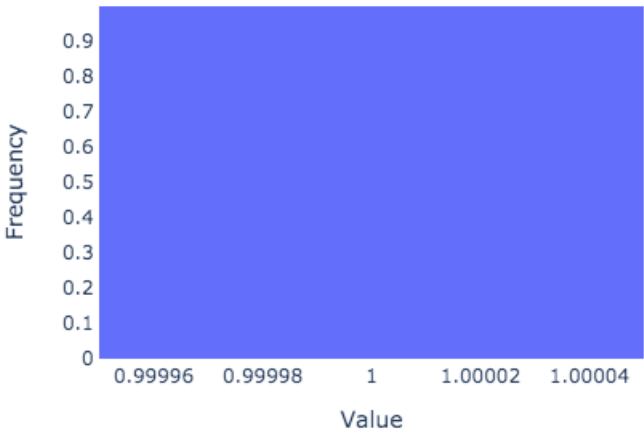## Case 0: LinearEstimator(True)
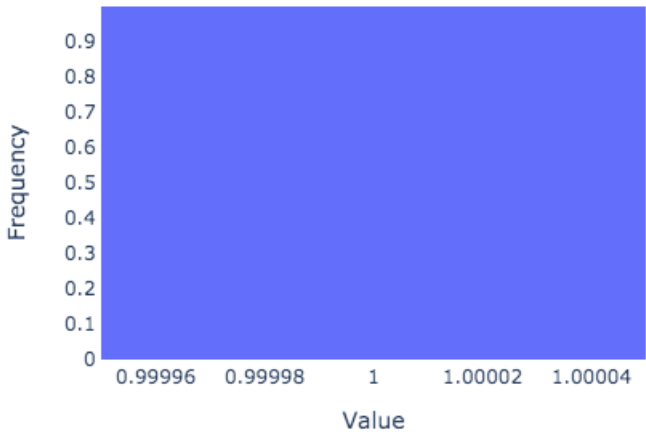
N=100, Nrep=100

N=1000, Nrep=100



## Case 2: ProjectedLinearEstimator(True)

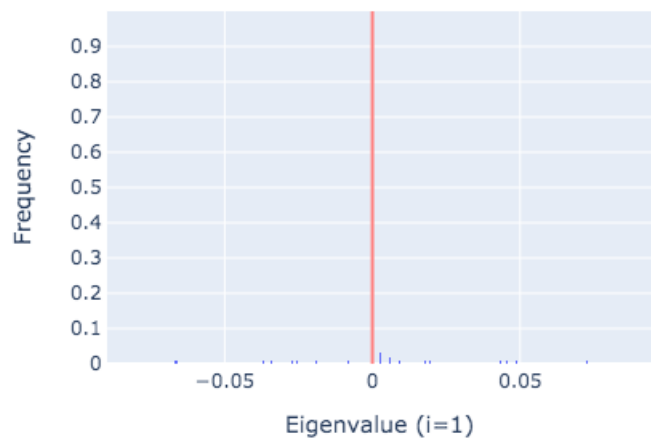N=100, Nrep=100

N=1000, Nrep=100



# on_para_eq_constraint=False
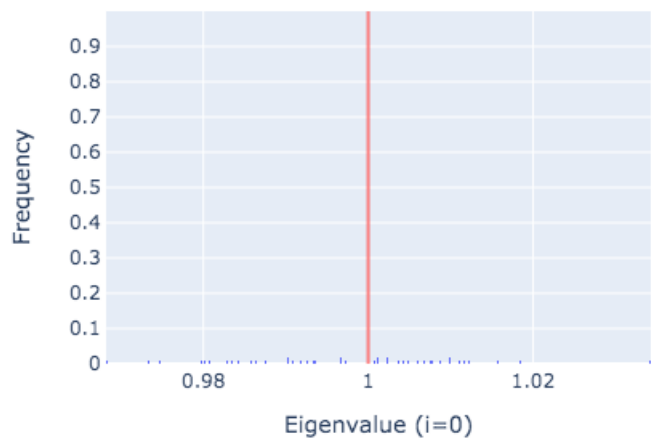
## Eigenvalue

## Case 1: LinearEstimator(False)
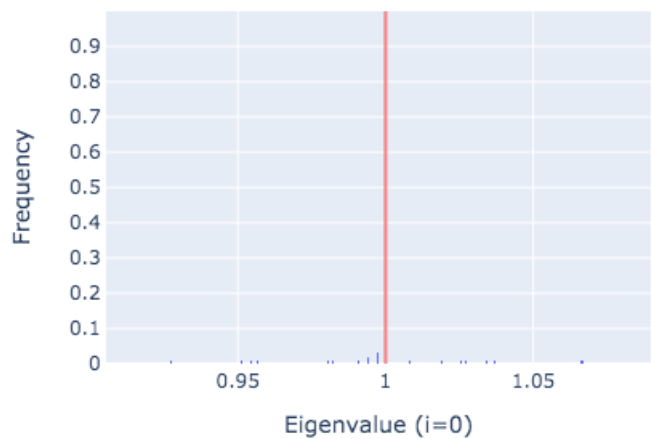
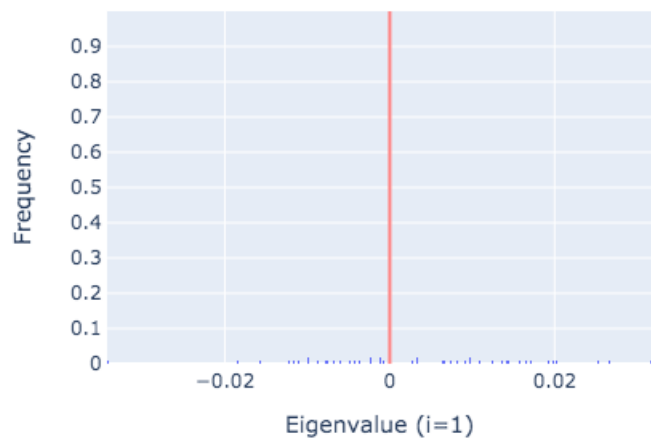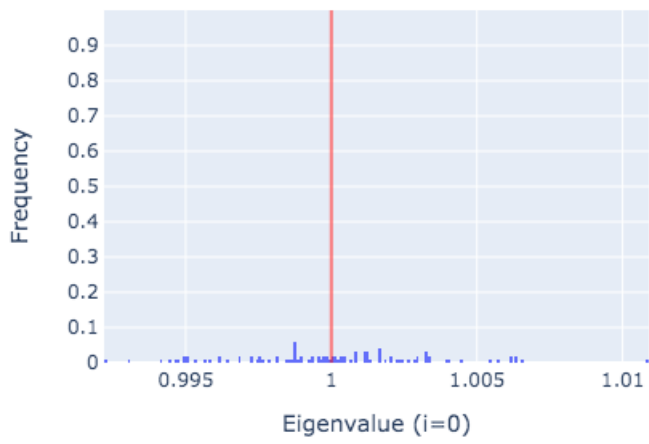### N=100, Nrep=100

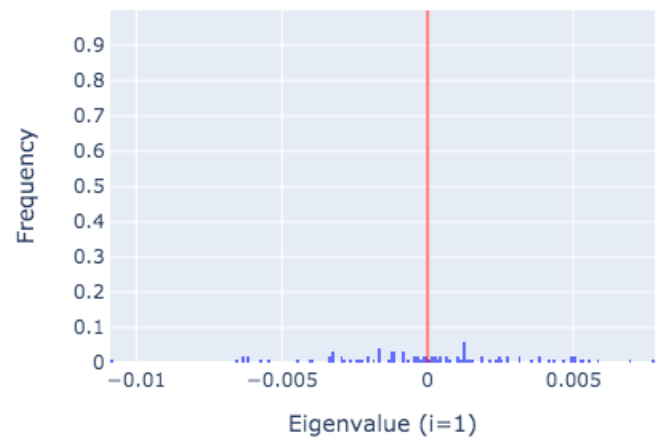

### N=100, Nrep=100



### N=1000, Nrep=100



### N=1000, Nrep=100

N=10000, Nrep=100



N=10000, Nrep=100



## Case 3: ProjectedLinearEstimator(False)

N=100, Nrep=100



N=100, Nrep=100

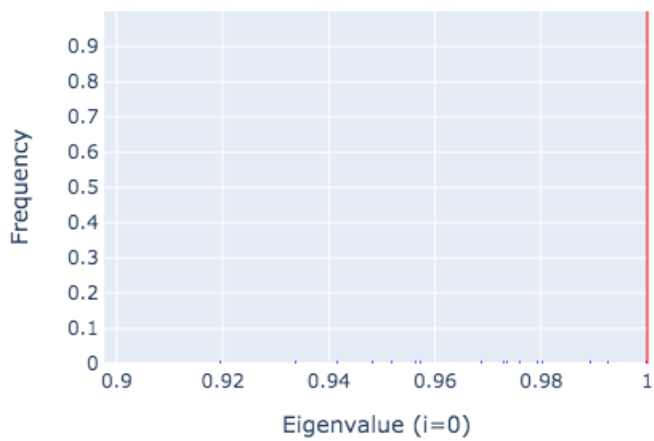N=1000, Nrep=100


N=1000, Nrep=100


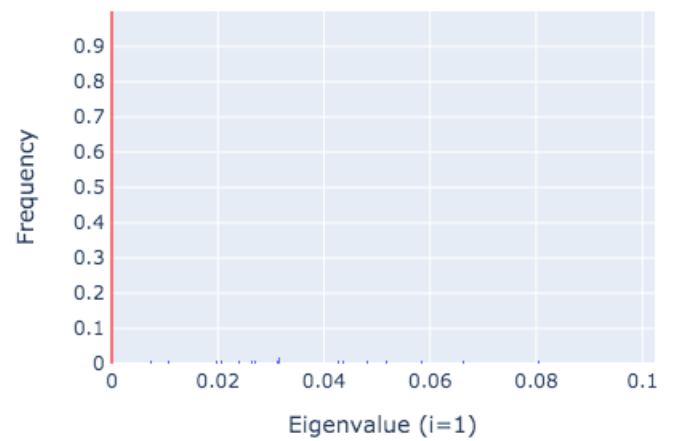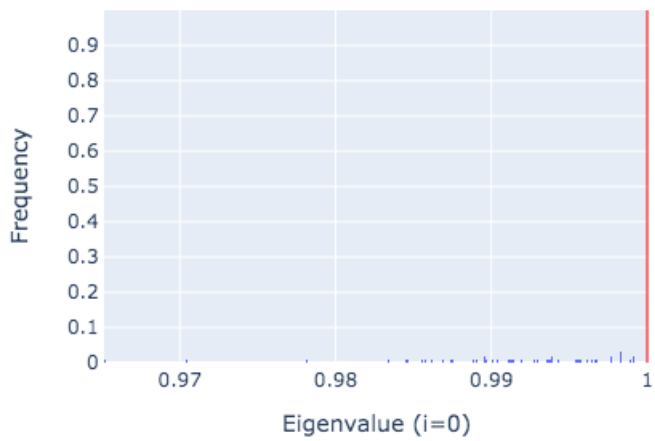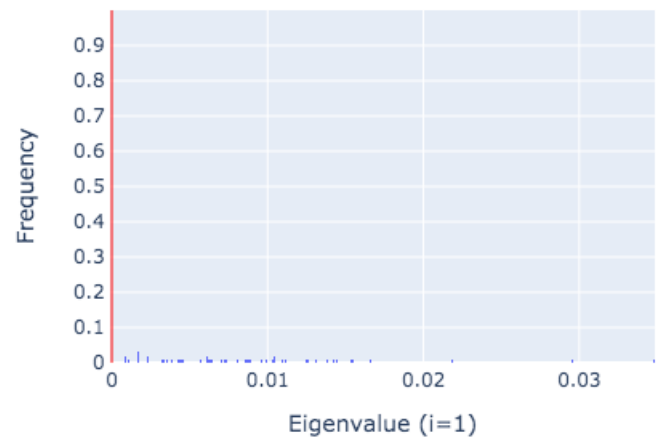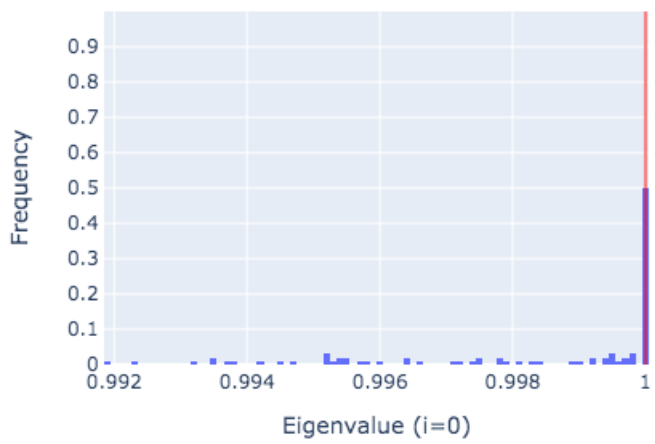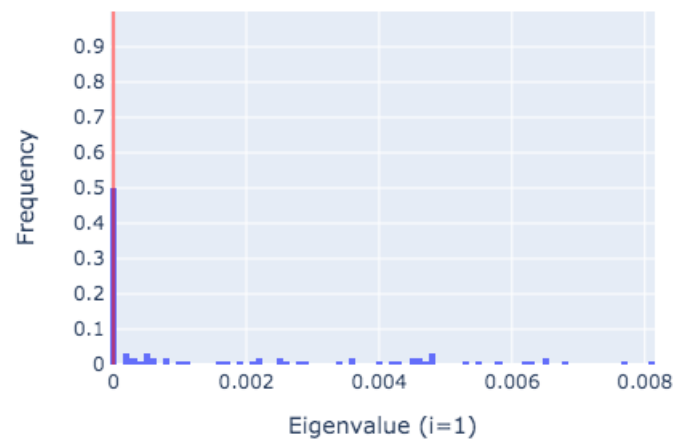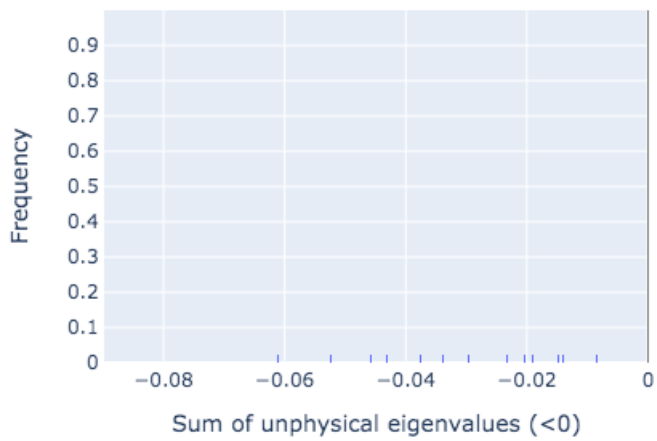N=10000, Nrep=100


N=10000, Nrep=100

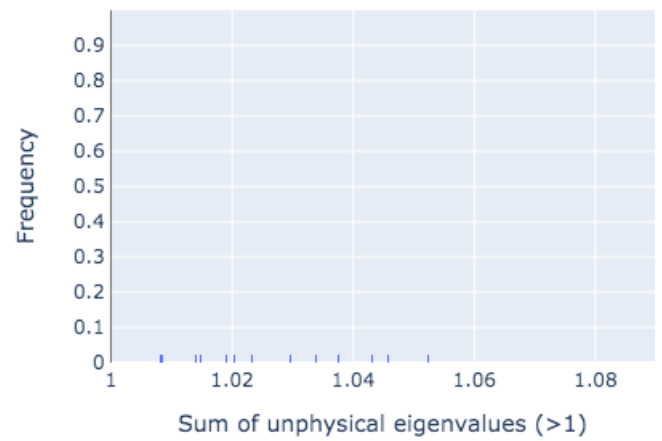## Sum of unphysical eigenvalues

### Case 1: LinearEstimator(False)
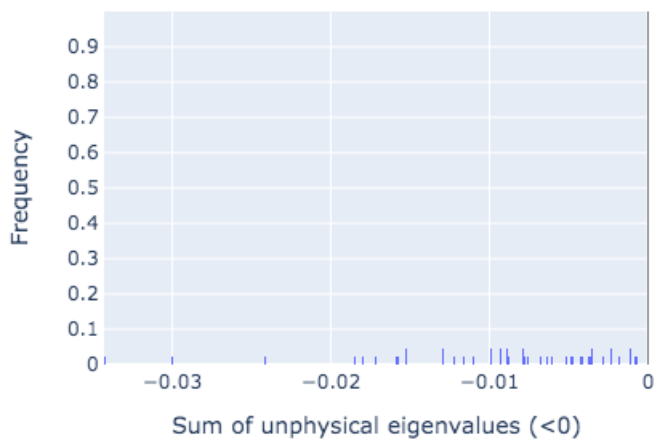
**N=100, Nrep=100**
**Number of unphysical estimates=48**



**N=100, Nrep=100**
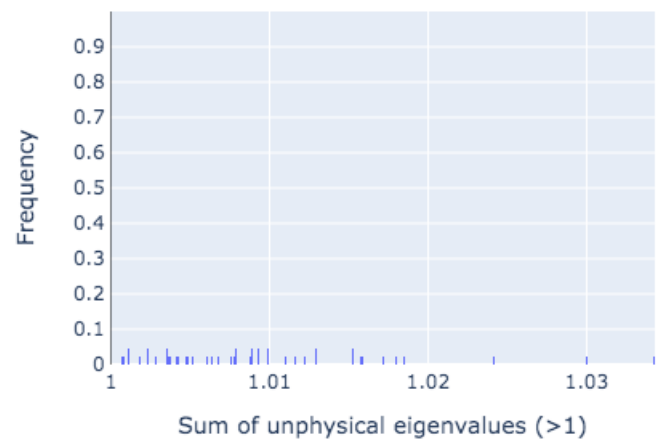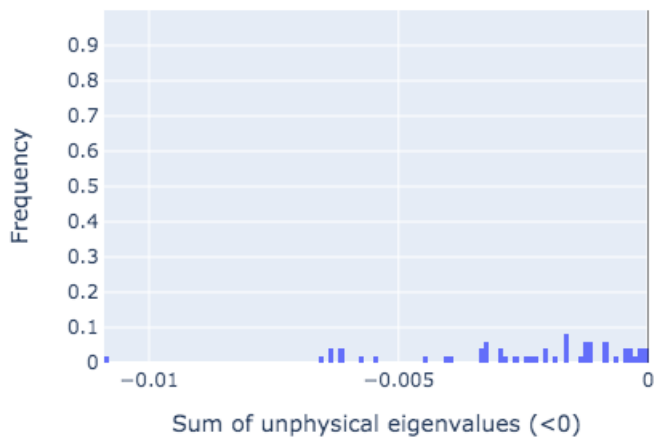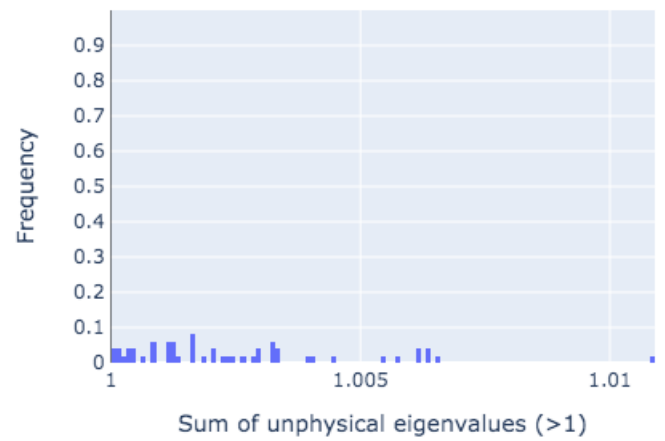**Number of unphysical estimates=48**



**N=1000, Nrep=100**
**Number of unphysical estimates=46**



**N=1000, Nrep=100**
**Number of unphysical estimates=46**

N=10000, Nrep=100
Number of unphysical estimates=50
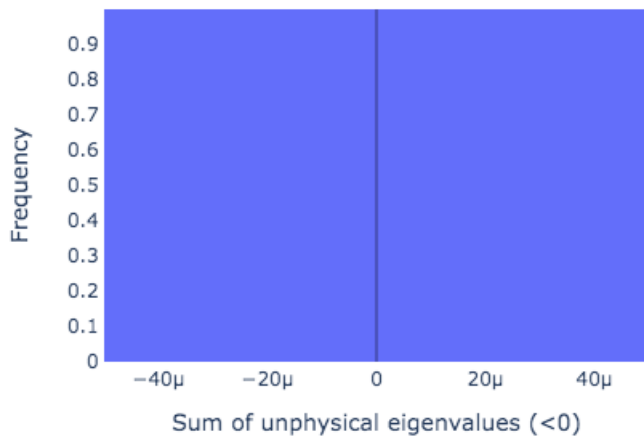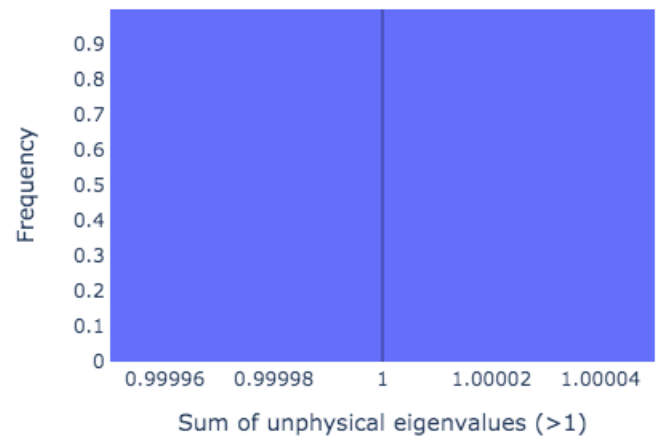


Frequency (y-axis, left plot)
x-axis: Sum of unphysical eigenvalues (<0)

N=10000, Nrep=100
Number of unphysical estimates=50



Frequency (y-axis, right plot)
x-axis: Sum of unphysical eigenvalues (>1)

**Case 3: ProjectedLinearEstimator(False)**

N=100, Nrep=100
Number of unphysical estimates=17



Frequency (y-axis, left plot)
x-axis: Sum of unphysical eigenvalues (<0)

N=100, Nrep=100
Number of unphysical estimates=17



Frequency (y-axis, right plot)
x-axis: Sum of unphysical eigenvalues (>1)

**N=1000, Nrep=100**
**Number of unphysical estimates=30**



Sum of unphysical eigenvalues (<0)

**N=1000, Nrep=100**
**Number of unphysical estimates=30**



Sum of unphysical eigenvalues (>1)

**N=10000, Nrep=100**
**Number of unphysical estimates=50**



Sum of unphysical eigenvalues (<0)

**N=10000, Nrep=100**
**Number of unphysical estimates=50**



Sum of unphysical eigenvalues (>1)