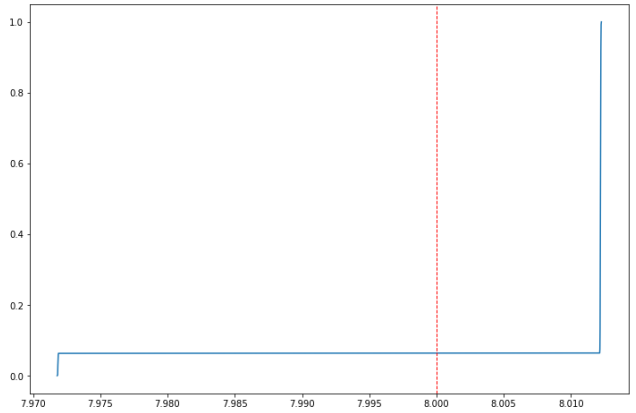
Cumulative Posterior Distributions

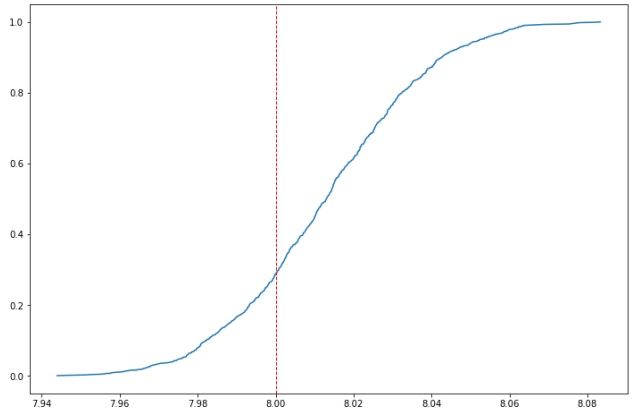
Offline SHMC



m=1/cov, L=20, eta=$5 \cdot 10^{-12}$

(evolution times chosen offline; increment=0.08)

Offline SMC (SIR)

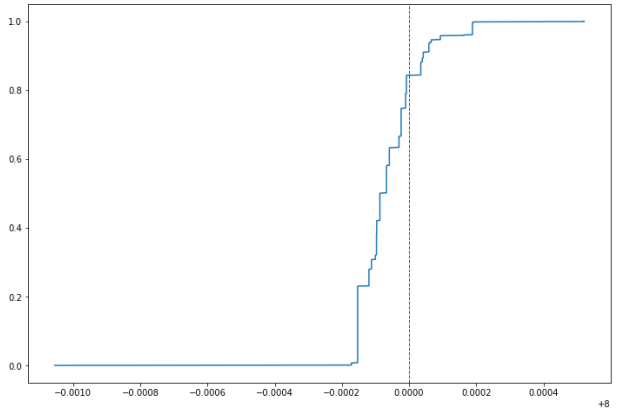


a=0.98, ESS_threshold=N_particles/2
Resampling:

$$\mu = a \cdot f_{particle} + (1 - a) \cdot \mu_{current}$$
$$\sigma = \sqrt{1 - a^2} \cdot \sigma_{current}$$

(evolution times chosen offline; increment=0.08)

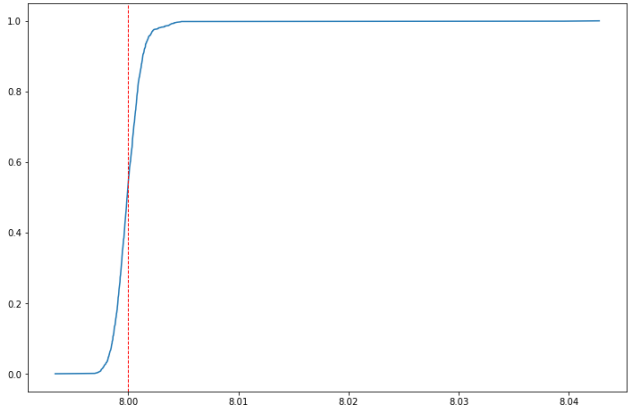
Adaptive SHMC



m=1/cov, L=20, eta=10^{-6}

(evolution times chosen adaptively; k=1.25)

Adaptive SMC (SIR)



a=0.98, ESS_threshold=N_particles/2
Resampling:

$$\mu = a \cdot f_{particle} + (1 - a) \cdot \mu_{current}$$
$$\sigma = \sqrt{1 - a^2} \cdot \sigma_{current}$$

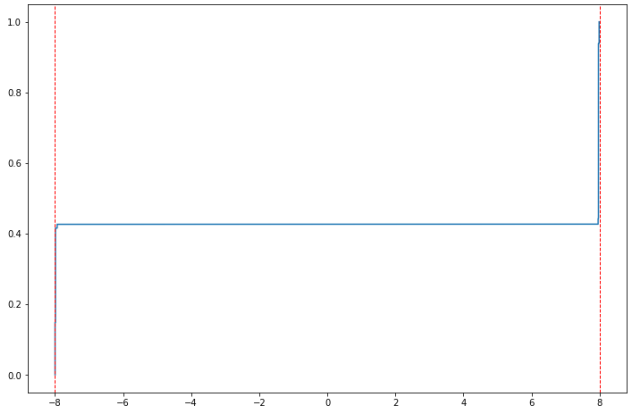
(evolution times chosen adaptively; k=1.25)

All: n=1000; N=100; f_max=10; f_real=8

Cumulative Posterior Distributions

(prior with support over negative frequencies)

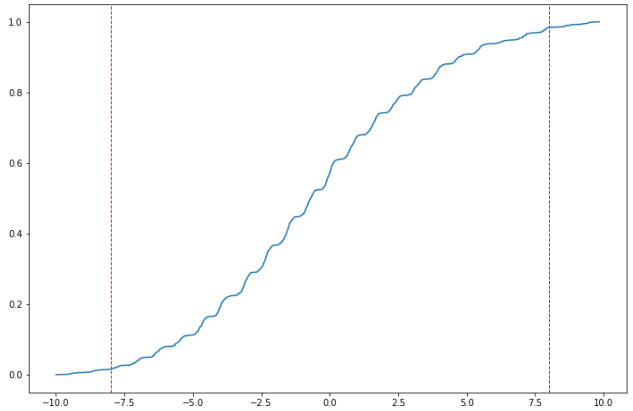
Offline SHMC



m=1/cov, L=20, eta=10^{-10}

(evolution times chosen offline; increment=0.08)

Offline SMC (SIR)



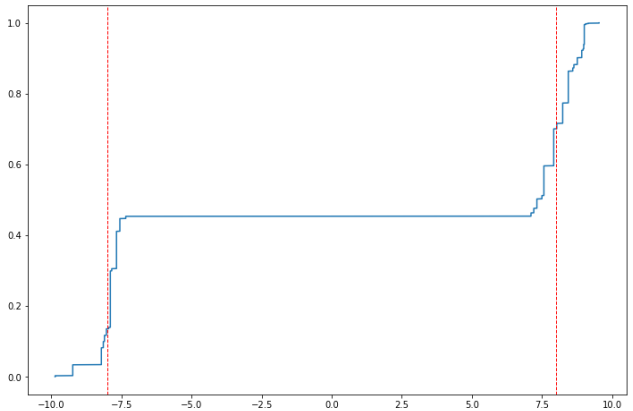
a=0.98, ESS_threshold=N_particles/2
Resampling:

$$\mu = a \cdot f_{particle} + (1-a) \cdot \mu_{current}$$

$$\sigma = \sqrt{1-a^2} \cdot \sigma_{current}$$

(evolution times chosen offline; increment=0.08)

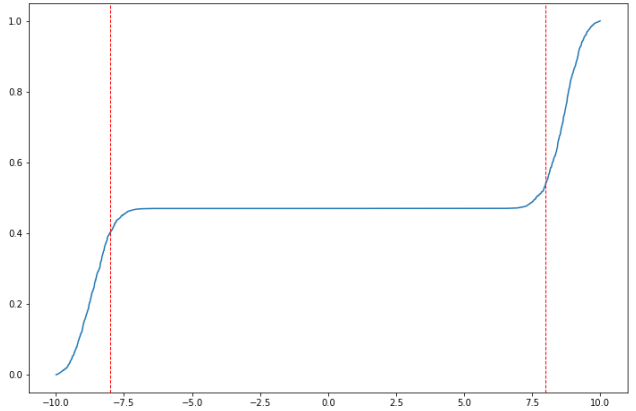
Adaptive SHMC



m=1/cov, L=20, eta=10^{-10}

(evolution times chosen adaptively; k=1.25)

Adaptive SMC (SIR)



a=0.98, ESS_threshold=N_particles/2
Resampling*:

$$\mu = a \cdot f_{particle} + (1-a) \cdot \mu_{current}$$

$$\sigma = \sqrt{1-a^2} \cdot \sigma_{current}$$

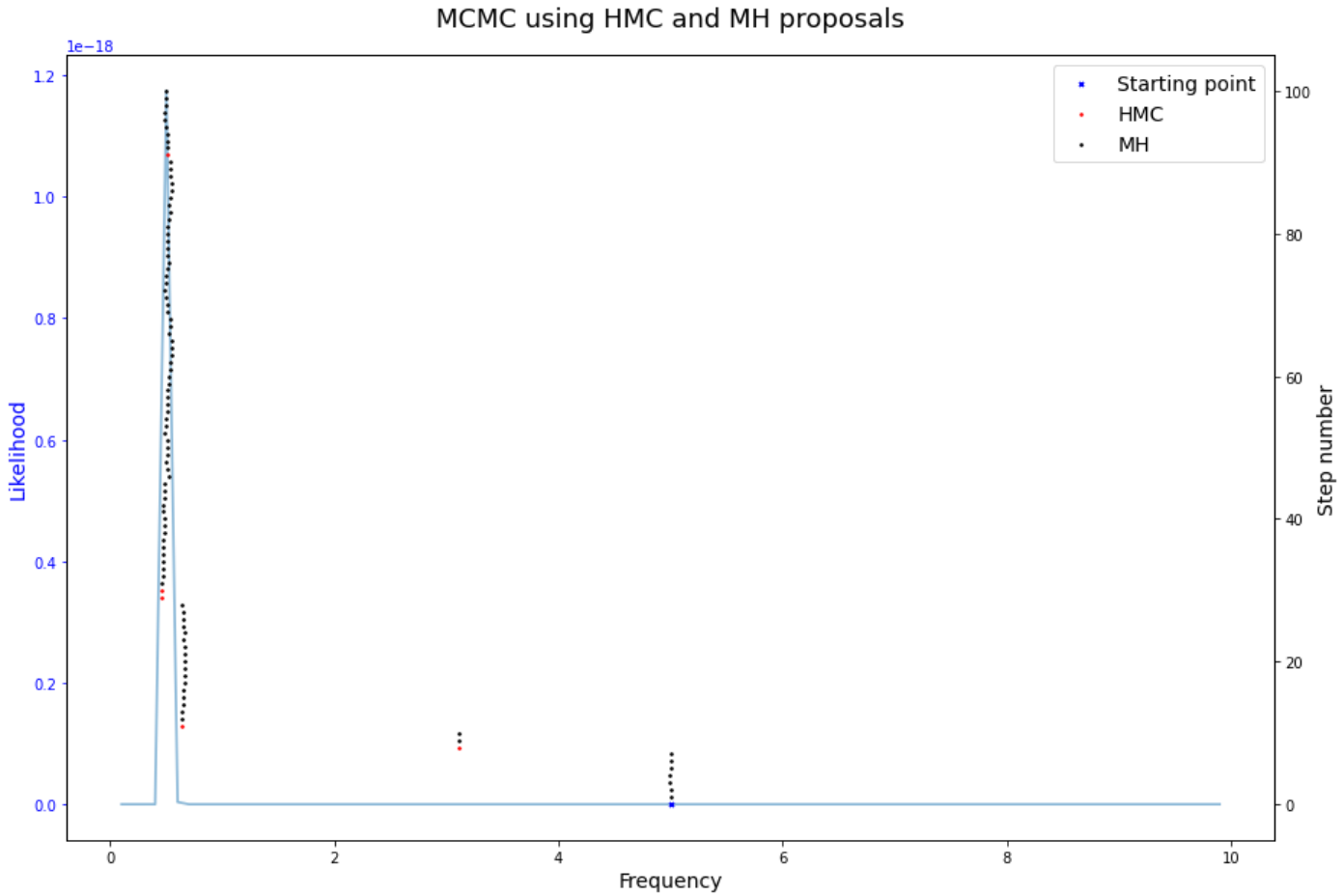
* ~10x less frequent than for offline

(evolution times chosen adaptively; k=1.25)

All: n=2000; N=100; f_max=10; f_real=8

MCMC (single particle)

(5% HMC steps)



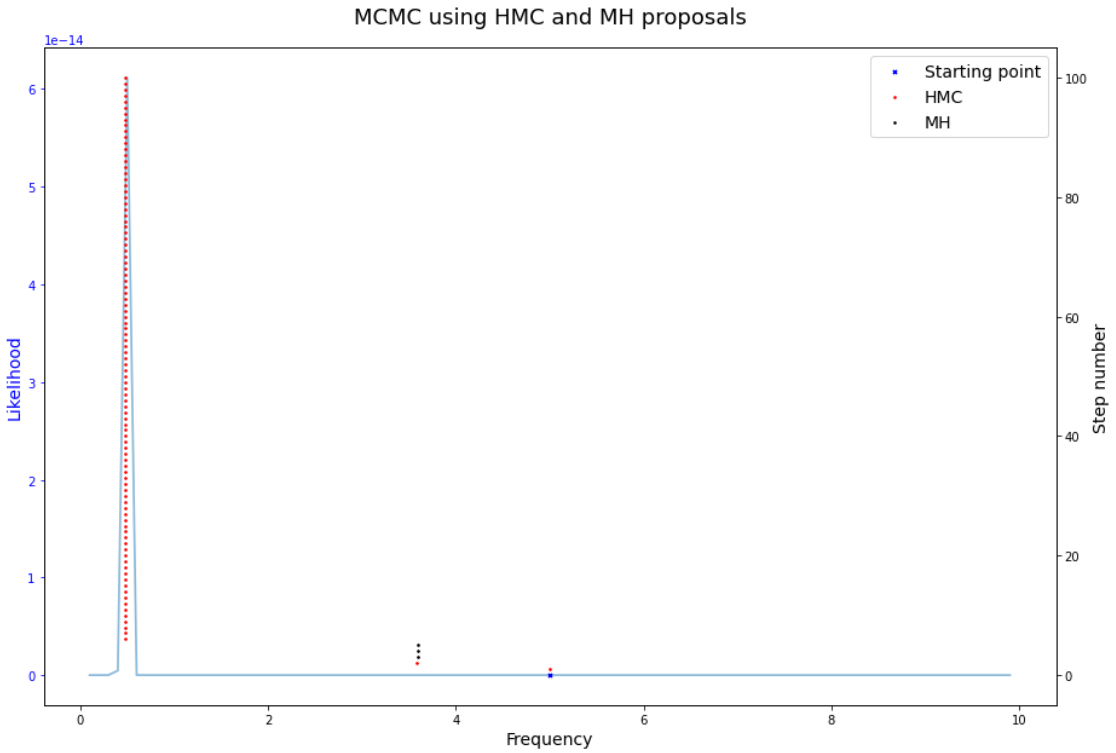
HMC: m=0.1, L=10, eta= $5 \cdot 10^{-3}$, threshold=0.01
MH: gaussian proposals, sigma=0.01
* Percentage of HMC steps: 5.0%.
* Hamiltonian Monte Carlo: 80% mean acceptance rate.
* Metropolis-Hastings: 82% meanacceptance rate.

(Move on product of all likelihoods, for evolution times chosen in advance; increment=0.08)

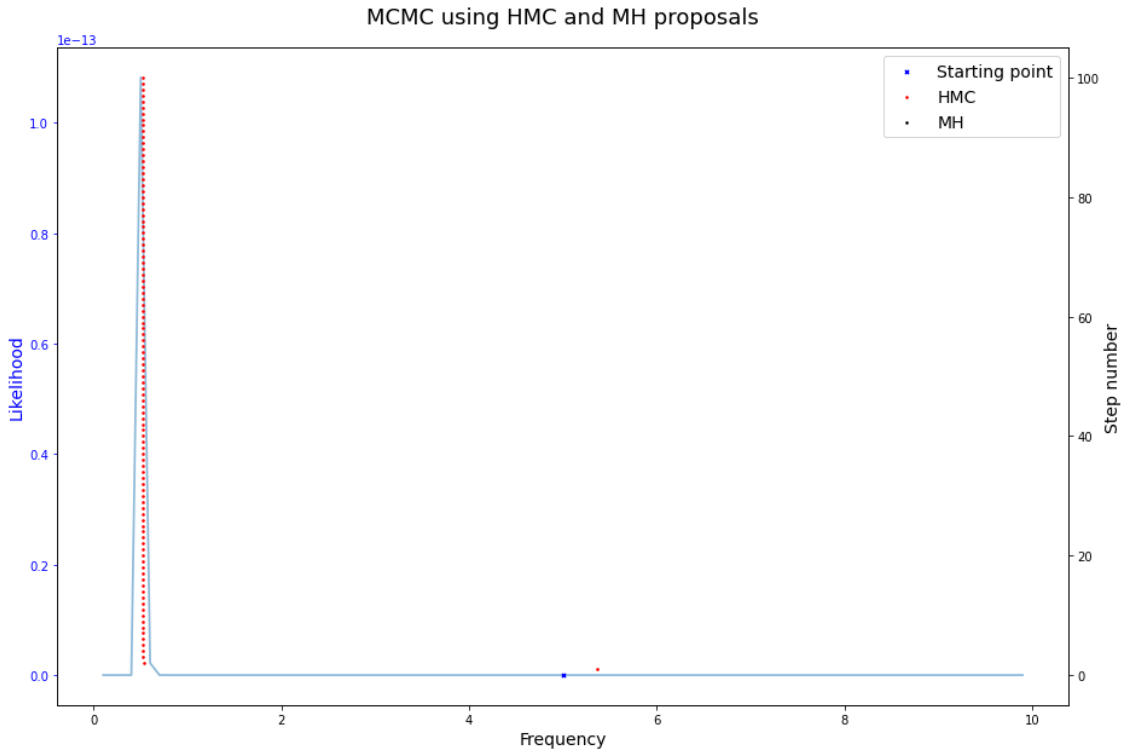
n=1; N=100; measurements=100; f_max=10

MCMC (single particle)

(95%+ HMC steps)



HMC: m=0.1, L=20, eta= 10^{-3}, threshold=0.01
MH: gaussian proposals, sigma=0.01
* Percentage of HMC steps: 97%.
* Hamiltonian Monte Carlo: 99% mean acceptance rate.
* Metropolis-Hastings: 33% mean acceptance rate.



HMC: m=0.1, L=20, eta= 10^{-3}, threshold=0.01
* Percentage of HMC steps: 100%.
* Hamiltonian Monte Carlo: 100% mean acceptance rate

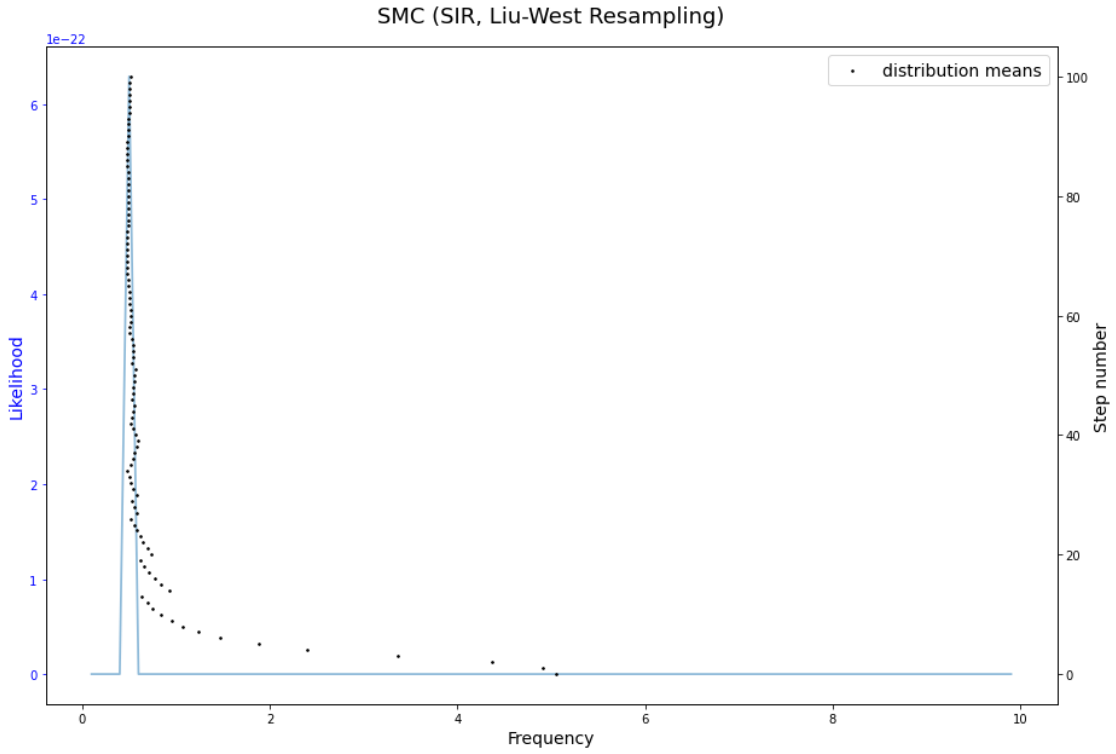
n=1; N=100; measurements=100; f_max=10

100 particle SMC vs. MCMC (single particle)

(Matched for number of measurements, measurement times, number of steps, real frequency, prior distribution, and constraints)

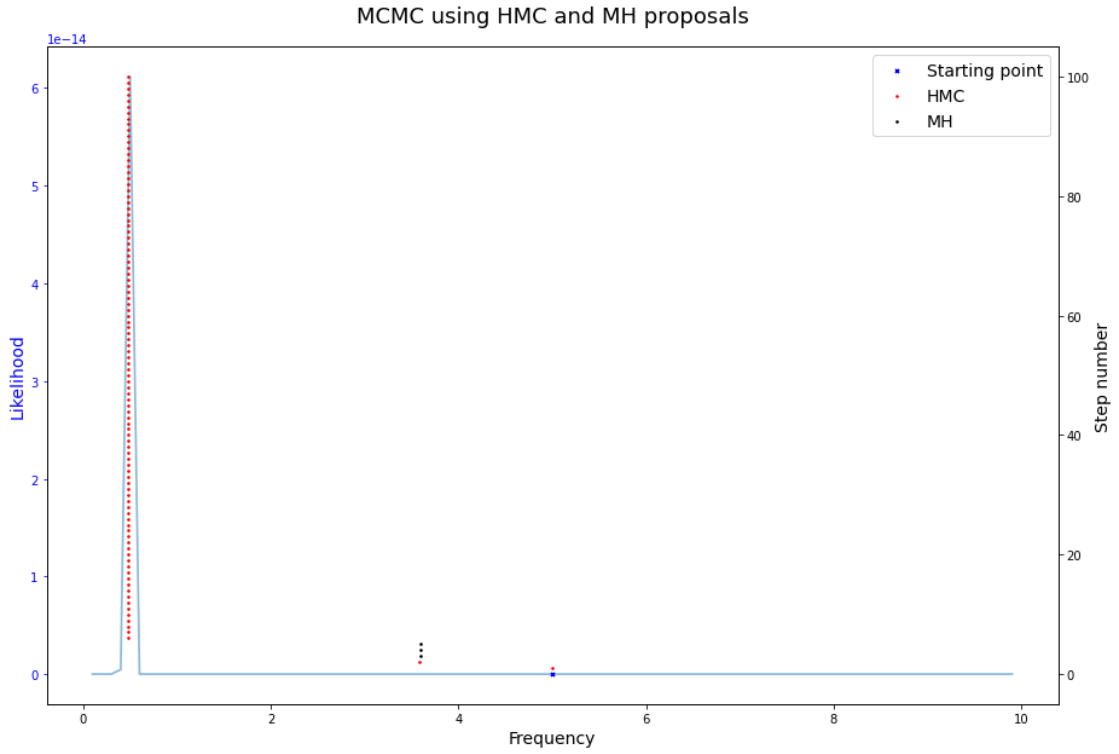
100 particles

(sample from consecutive cumulative products of likelihoods)



1 particle

(sample from the product of all likelihoods)



n=1 or 100; N=100; measurements=100; f_max=10

(evolution times chosen offline; increment=0.08)