

Supplementary Information

Protein-mediated electroporation in a Cardiac Voltage Sensing Domain due to a nsPEF stimulus

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1 membranes rotate 90°

Representation of different POPC rearrangement at different external \vec{E}_z (from 0.14 V/nm to 0.2 V/nm) after 50 ns of simulation. In all examples can be observed a turn of the POPC bilayer in 90°. Figure S1

2 RMSD of the selected replicas after the first filter and after the second filter

The Figure S2 are the RMSD as a function of time of the replicas that afford the condition of the first filter (derivative of the RMSD minor than 15% at the last 10 ns) and the replicas that pass the second filter (Have a RMSD final minor to 0.35 V/nm), given a total of 142 replicas.

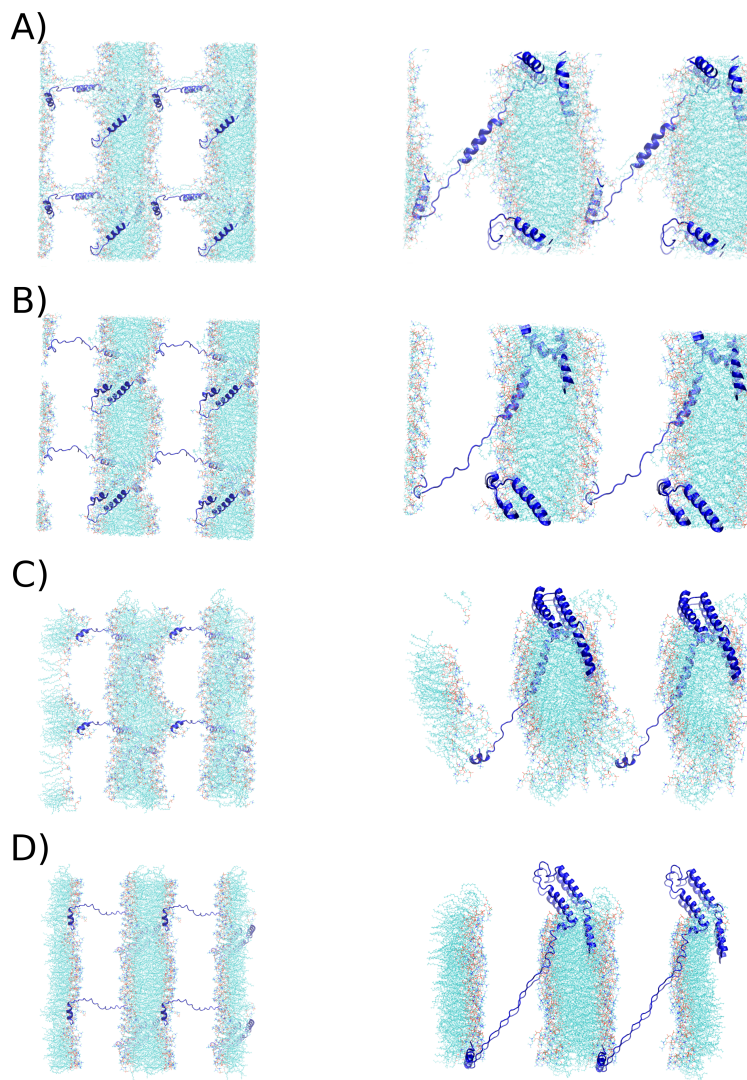


Figure S1: Examples of representation in lines of the POPC bilayer after 50 ns of simulation. All images in left are view above x-y plane, and in the right are view above z-x plane. A) Example of POPC rearrangement at $\vec{E}_z=0.14$ V/nm. B) Example of POPC rearrangement at $\vec{E}_z=0.16$ V/nm. C) Example of POPC rearrangement at $\vec{E}_z=0.18$ V/nm. D) Example of POPC rearrangement at $\vec{E}_z=0.2$ V/nm.

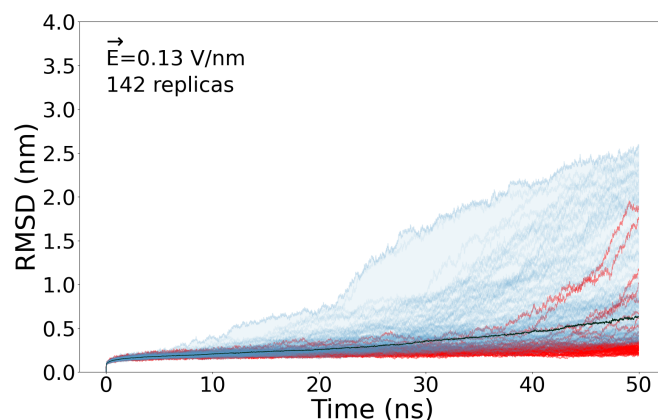


Figure S2: RMSDs of the 142 replicas that pass the first and second filter. In red the replicas that not pass the filters.

3 Examples of VSD rearrangement whit water crossing de bilayer at different ending VSD RMSD.

The next Figure shows four examples at different final RMSDs of the VSD structure together with the water inside the VSDs, representation extracted from the 200 replicas under an external $\vec{E}_z=0.13$ V/nm. This gives an idea of the structure of the VSD as a function of the RMSD.

4 3D cube representing the Tuples covering the phase space

The next Figure represent all tuples, to be sure that the data is covering the phase space to be able to calculate ΔG^0 between clusters.

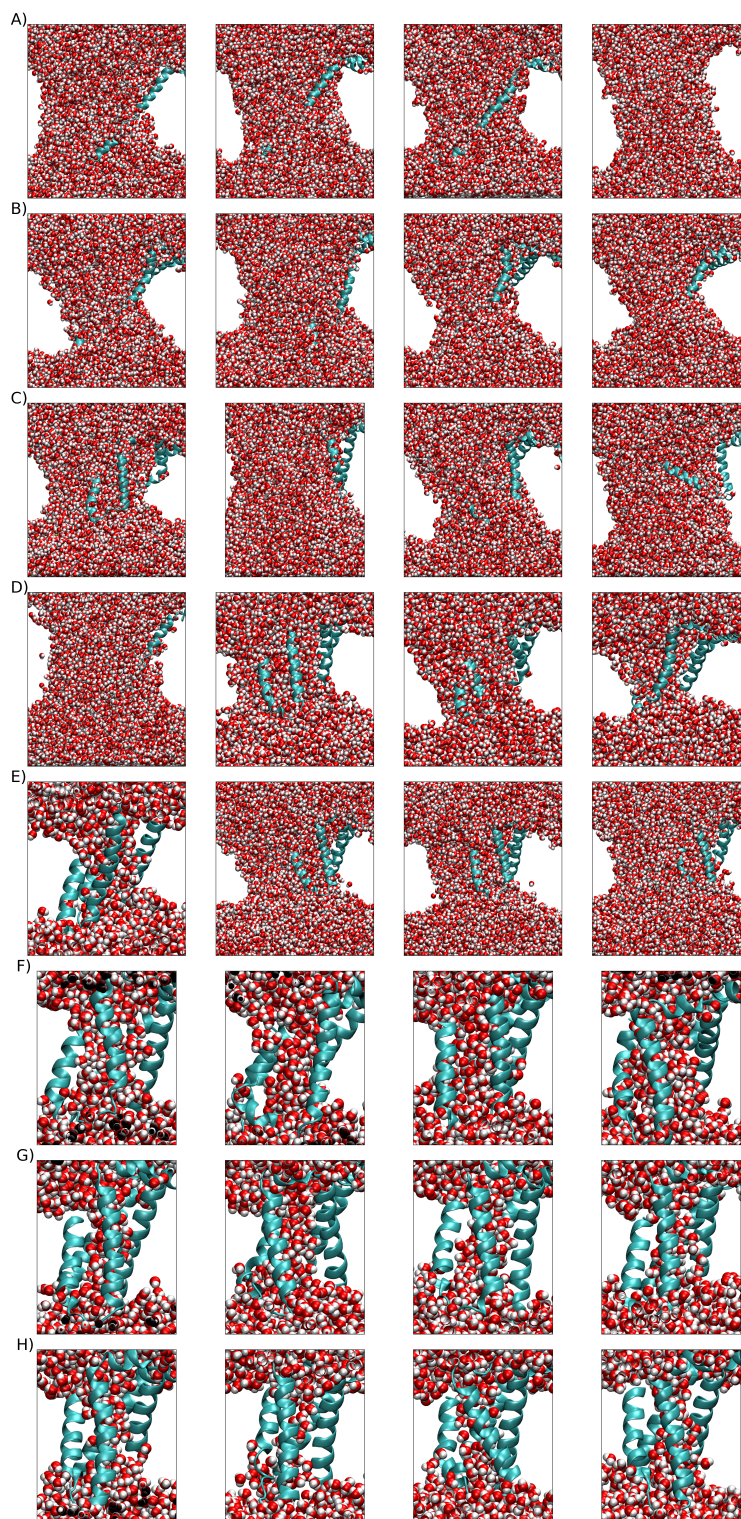


Figure S3: In all images the protein is represented in sky blue cartoon, and water in van der waals representation. A) Images of the four replicas ending in the higher RMSD. B) Images of four replicas with the RMSD more close to RMSD=2 nm below it. C) Images of four replicas with the RMSD more close to RMSD=1.8 nm below it. D) Images of four replicas with the RMSD more close to RMSD=1.6 nm below it. E) Images of four replicas with the RMSD more close to RMSD=1.4 nm below it. E) Images of four replicas with the RMSD more close to RMSD=1.2 nm below it. E) Images of four replicas with the RMSD more close to RMSD=0.8 nm below it. E) Images of four replicas with the RMSD more close to RMSD=0.4 nm below it. E) Images of four replicas with the RMSD more close to RMSD=0.3 nm below it

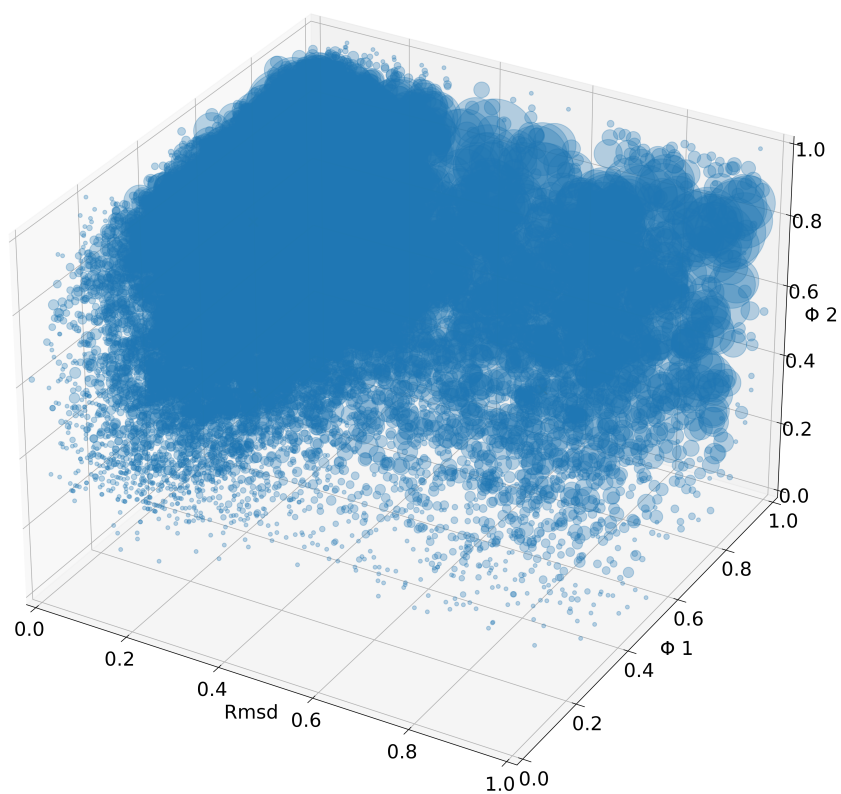


Figure S4: 3D cube with all Tuples. ϕ =FNC.