# MODULATION OF NEURONAL ACTIVITY WITH EXTREMELY LOW-FREQUENCY MAGNETIC FIELDS: INSIGHTS FROM BIOPHYSICAL MODELING

Time-varying magnetic stimulation of the central nervous system is nowadays a promising therapeutic approach already used to alleviate the symptoms in a variety of neurological disorders. Transcranial Magnetic Stimulation (TMS) is an example of a successful application involving specific patterns of magnetic field (MF) for therapeutic use, which provides clinical improvement in movement disorders or depression. Other neuromodulation strategies consist in proposing several orders of magnitude lower magnetic stimuli that are more flexible in terms of shape and frequency of the signal. However, the refinement of both of these techniques is limited due to the lack of understanding of the underlying mechanisms supporting the interaction between the magnetic stimulus and brain tissue. To provide insights into the modulation of neuronal activity by extremely low-frequency (ELF) MF, we present biophysical modeling results regarding 1) single neuron exposure to an ELF MF, and 2) neuronal network exposure to an ELF MF. These results shed light on the effect of ELF MFs on neuronal activity from the single cell to the network level, and illustrate the importance of a number of factors both in ELF MF characteristics and brain tissue properties in determining the outcome of the exposure. These principles may guide future therapeutic developments.