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Predicting the Effects of Broadband Radiofrequency Radiation on Radical Pairs in Biological Systems

Is wireless charging of our electronic devices dangerous to our cells? Large tech companies are currently developing medium and long range radiofrequency radiation (RF) wireless charging devices, making it relevant to understand potential effects on humans. Recent experiments have reported an effect of weak radiofrequency magnetic fields in the MHz-range on the concentrations of reactive oxygen species (ROS) in living cells.

Including broadband radiofrequency (BBRF) radiation in calculations is non-trivial, as methods need to account for both the oscillating nature of the fields as well as the broad spectrum of frequencies present (ie., broadband radiation). Performing calculations numerically requires discretizing the fields, both with respect to time, space, and frequency band. The computational efforts can, however, be focused on radical pairs present in biological systems, as these are the ones that respond most strongly to weak external magnetic fields. I will give a brief introduction into the challenges of resolving these obstacles, as well as our current strategy for including BBRF radiation in computational model systems.

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