A new view on the mechanism for generating evoked fields

Takashi Hamada
Institute for Human Science and Biomedical Engineering
E-mail: hamada-takashi@aist.go.jp

AIST Today
Vol.5 , No.1 (2005)15

I analyzed not-averaged neuromagnetic responses to repetitive sounds. It was found that ongoing oscillations around 6 Hz are relevant for generating the auditory evoked fields. Namely, phases of the oscillation were locked, their magnitudes were increased and magnetic fields were often reduced to an equivalent current dipole in the auditory cortex at around the timings of N100m, but the phases were unlocked and the fields were seldom reduced to a dipole at the other timings. These lines of evidence suggest there exist several oscillators within the cortex whose phases are locked at around the timings of N100m, but otherwise unlocked.

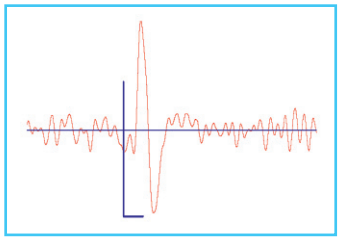

Fig.1 Auditory evoked field. Vertical bar: onset and 100 fT/cm. Horizontal bar: 100 ms.

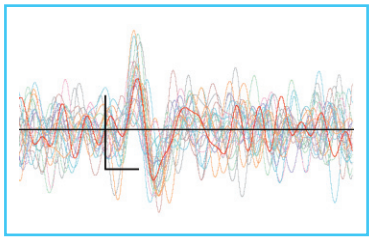

Fig.2 Raw data after passed the band-pass filter in 20 consecutive trials. Scales are the same as in Fig.1.

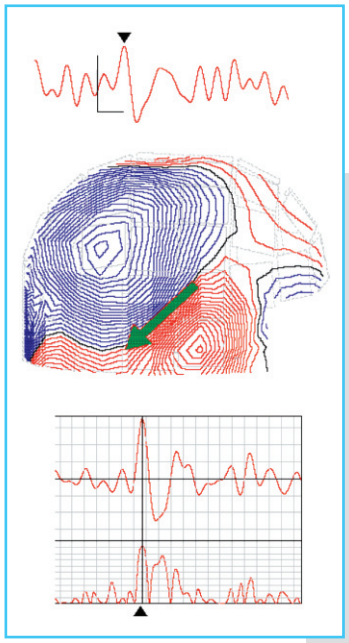

Fig.3
(a): One of the traces in Fig.2.
(b): Magnetic field above the right cortex at the timing shown by a triangle in (a), and the estimated dipole.
(c): Magnitude (20 nAm step) and goodness-of-fit (10 % step) of the estimated dipole vs. time (50 ms step).

Development of multi-component MO method beyond Born-Oppenheimer approximation

Takayoshi Ishimoto
Grid Technology Research Cetnter
E-mail: t.ishimoto@aist.go.jp

AIST Today
Vol.5, No1 (2005) p18

In order to explore the nature of hydrogen-bonding with isotope effect, we have developed the multi-component molecular orbital (MC_MO) method, which takes into account the quantum effect of proton and deuteron, beyond Born-Oppenheimer approximation. In the case of H_2, HD, and D_2 molecules, we have clearly demonstrated that the difference of charge distributions between proton and deuteron reflects the electronic structure and bond distance (see Figure 1). This MC_MO method is a powerful tool to study the geometrical and kinetic isotope effects for various chemical phenomena, such as the hydrogen-absorbing metallic nanoparticle, C-H...O type hydrogen-bonding, and hydrogen (proton) abstraction reaction.

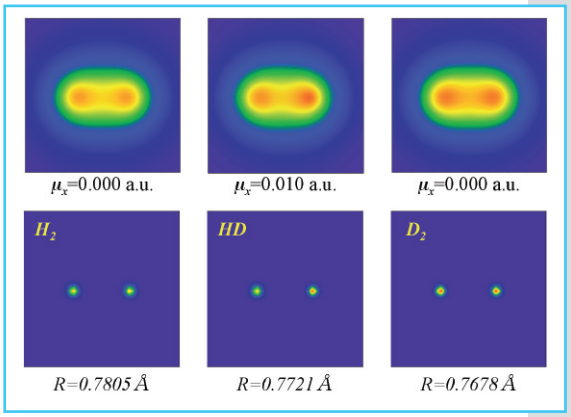

Fig. Charge distributions of nuclei (lower panel) and electrons (upper panel) of H_2, HD, and D_2 molecules. The internulear distances and dipole moments are shown as R and μx, respectively.