

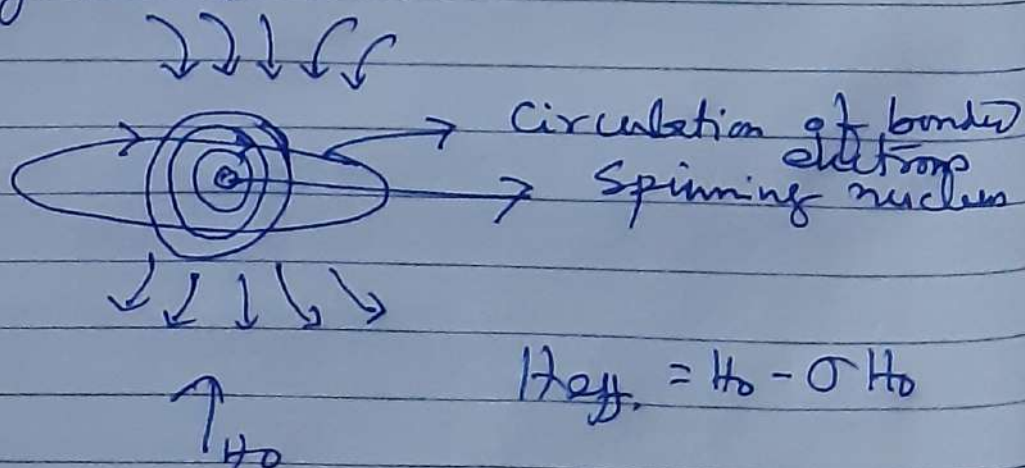
* Reason for different chemical shifts for different types of protons.

The shielding of a proton experience of combination of at least three types of electronic circulation causing a change in effective magnetic field different from the applied magnetic field (H_0). This three types of electronic circulations are —

- (i) Local diamagnetic field.
- (ii) Paramagnetic & diamagnetic anisotropic effect caused by the neighbouring atoms or groups of atoms.
- (iii) Interatomic ring currents as in aromatic compounds.

(i) Local diamagnetic effect :-

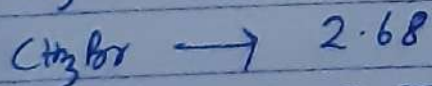
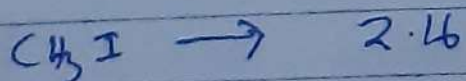
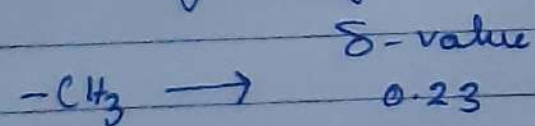
Circulation of pair up electrons with which the proton is bonded with other nuclei producing a local diamagnetic effects.



For molecules in which the protons are surrounded by very heavy spherical distribution of electrons e.g. CH_4 , local diamagnetic circulations of the electrons are the most important electronic circulation contributing to shielding. Such local diamagnetic shielding always reduces the apparent magnetic field of the proton and is a source of a (+)ve shielding. The degree of such shielding is clearly dependent on the electron density around the protons. Higher the electron density on the proton higher the field and consequently lower the δ value at which the proton absorbs or resonates.

Thus if local diamagnetic effect is the only source of shielding it is in line with the inductive effect of the attached group. More electronegative substituents increases deshielding.

Correlation of shielding characteristics & electronegativity in simple saturated molecules.



Proton will be deshielded

