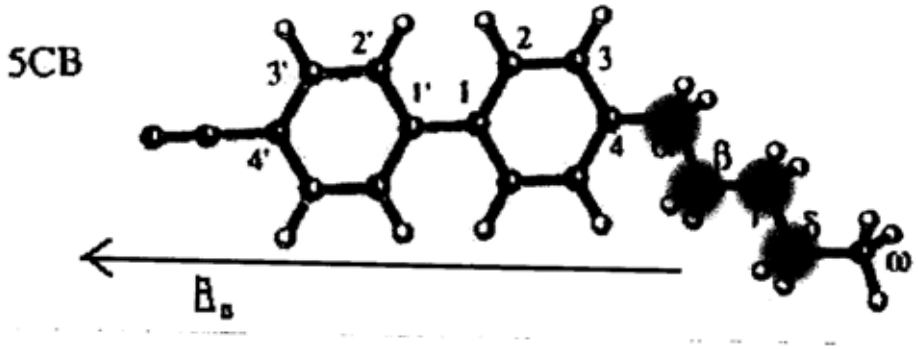
3. Appendix 2: More about the cross-polarization

The cross-polarization in liquid crystals can be used as a tool of measure of mobility of the different part constituing the molecule, in its nematic phase [PR96].

As an illustration of this, let us just consider, in 5CB, the cross polarization curves between the carbons $\alpha, \beta, \gamma, \delta$ and their respective ^1H neighbours.

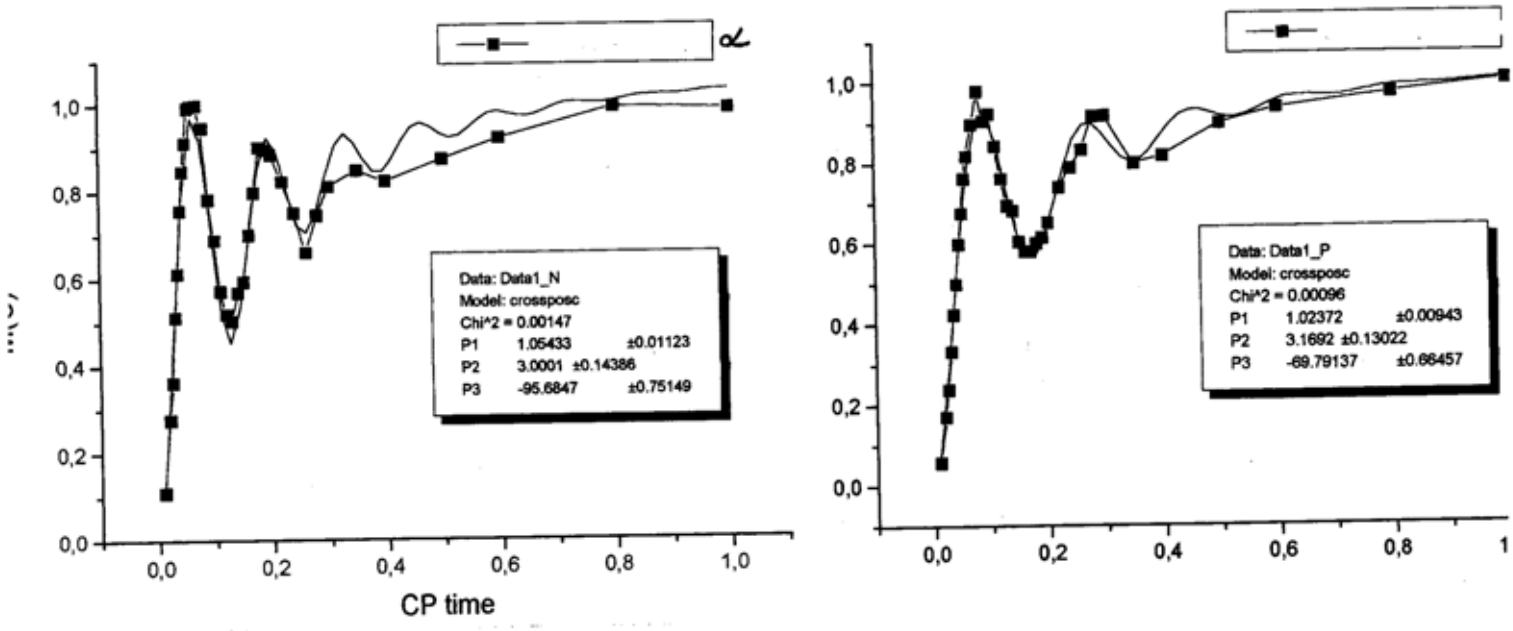


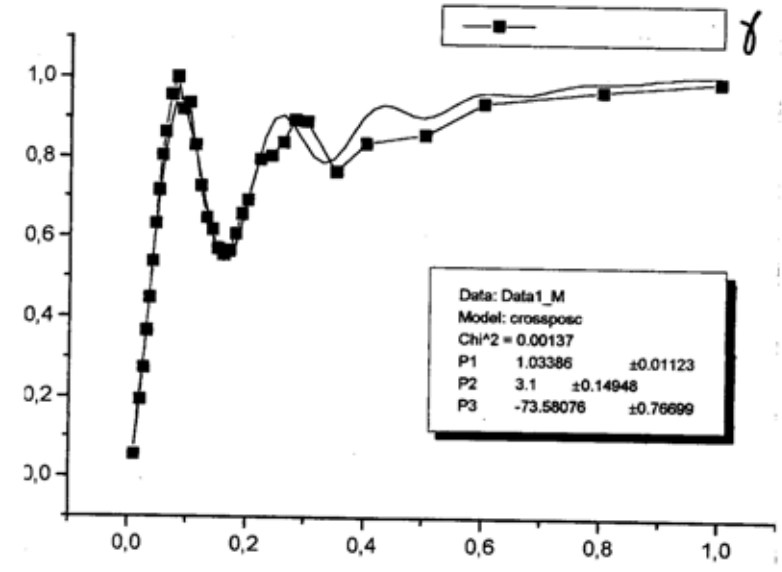
The considerated carbons in our study.

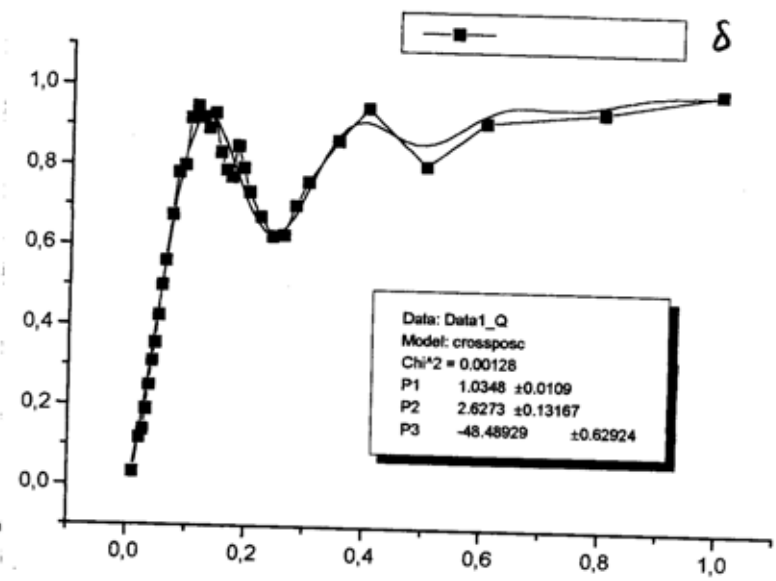
Since those carbons have the same relative orientations with their ^1H neighbours with respect to B_0, we should observe more or less the same cross-polarization curves.

Results

The cross-polarization curves are the following:





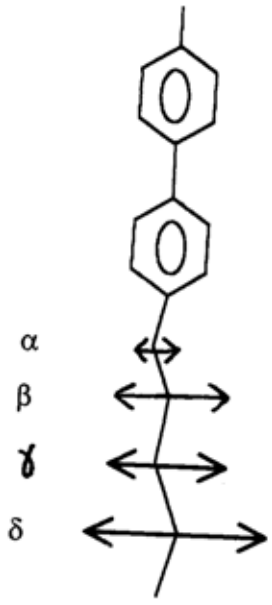


We observe that the rapidity of the oscillations, i.e the efficiency of the magnetization transfer, changes much from one site to another !

Site	Pulsation ω_{IS} (KHz)
α	96
β	70
γ	74
δ	48

It can be thought that the effective interaction parameter is modulated by motion: the more motion of the considered site, the less the polarization transfer is efficient.

We then can map the amplitude of the motion in the crystal liquid:



The motion in the queue of the 5CB, mapped by cross-polarization frequency studies.
The double arrows are proportional to the amplitude of motion of the corresponding Carbon site.

conclusion:

A measure of the frequency of the oscillations in the cross-polarization is a measure of the motion of the liquid crystal! This can be used to determine *order parameters*.