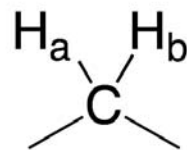
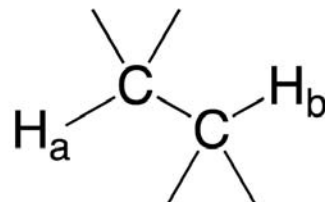


スピン-スピンカップリング

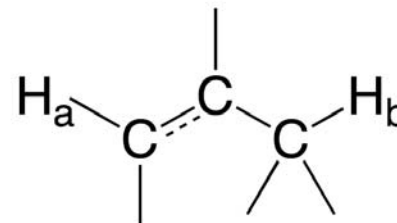


geminal ($^2J_{HH}$)
9~15 Hz

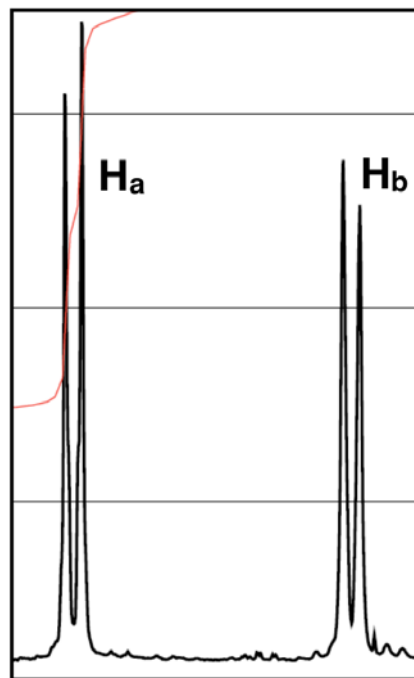


vicinal ($^3J_{HH}$)
0~18 Hz

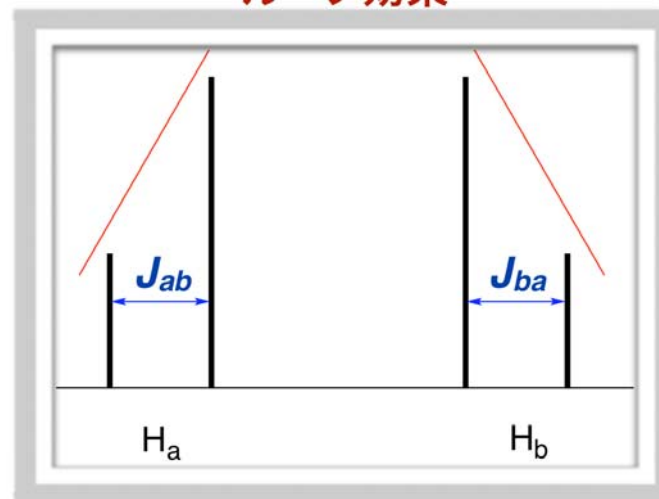
(自由回転系: 7~8 Hz)



long range ($^4J_{HH}$)
0~3 Hz



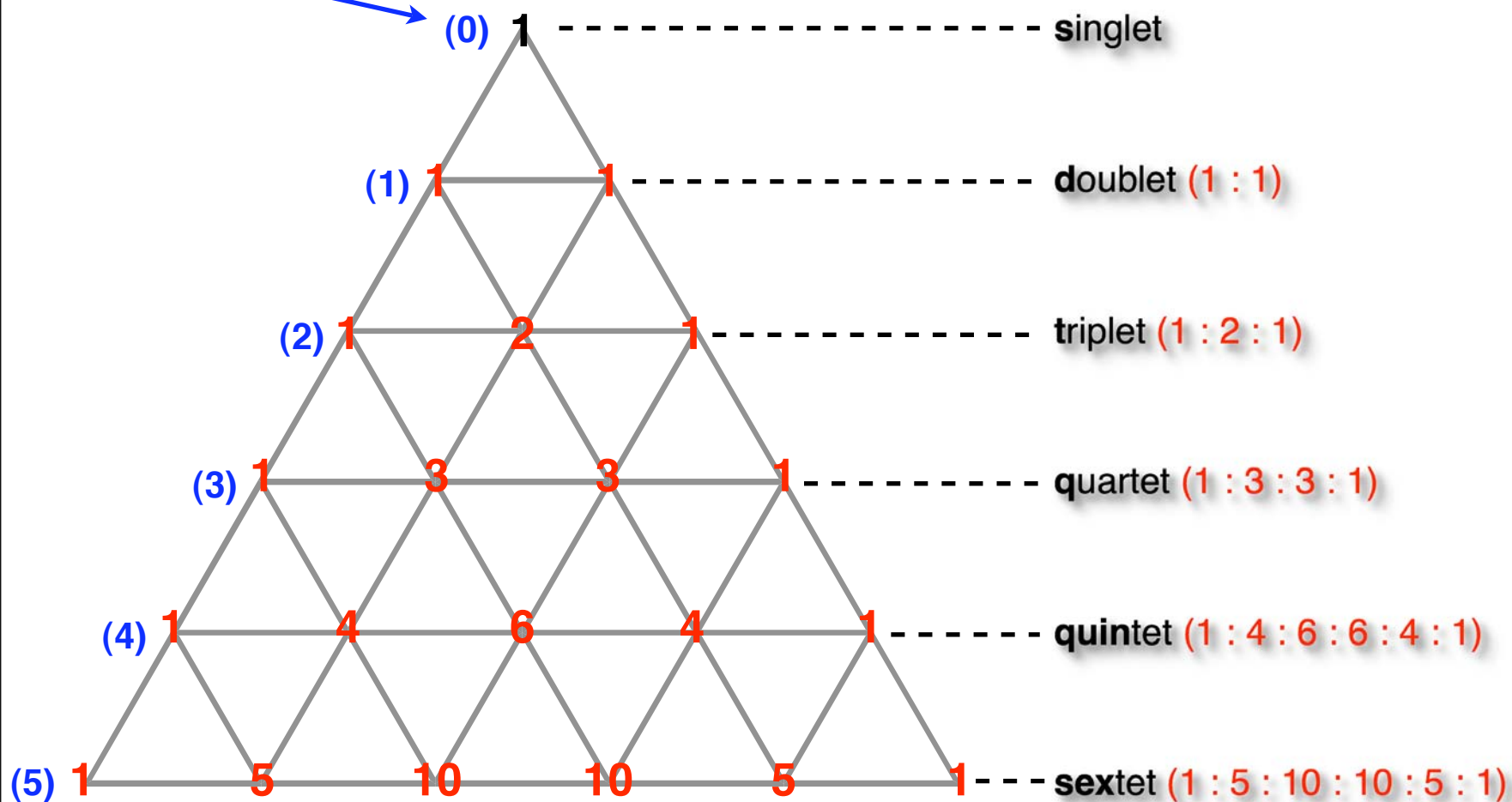
ルーフ効果



$J_{ab} = J_{ba}$ (カップリング定数: Hz)

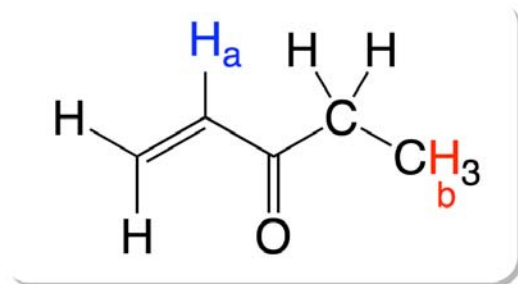
スピン-スピンカップリングの覚書 (N+1ルール)

隣接水素の数



赤色の数字はピーク強度比

複雑なスピン系

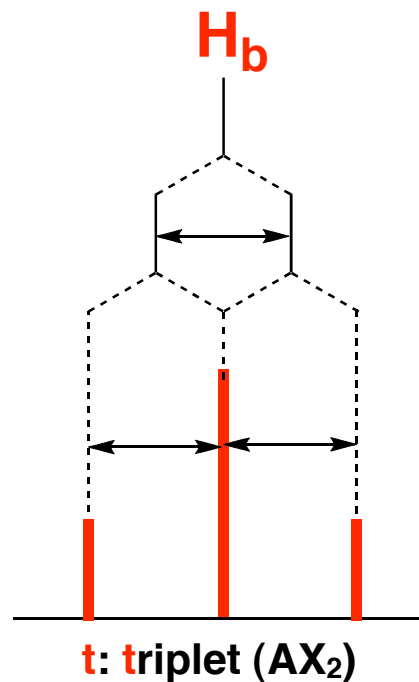
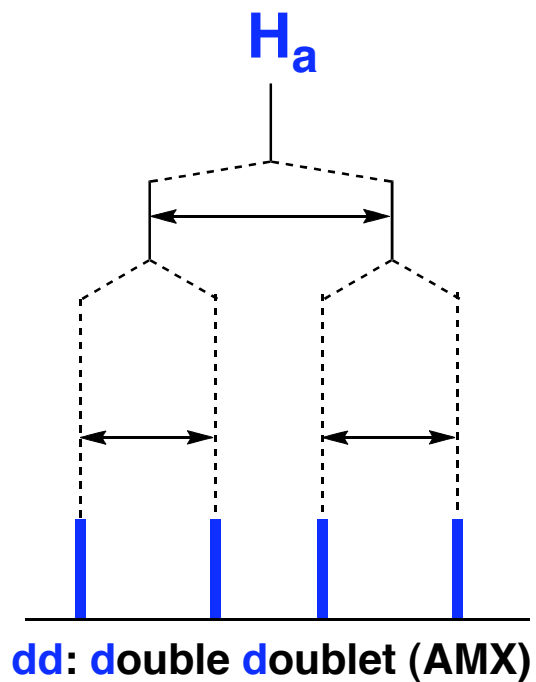


$A_nM_mX_l$ 系のA部分のスピン多重度

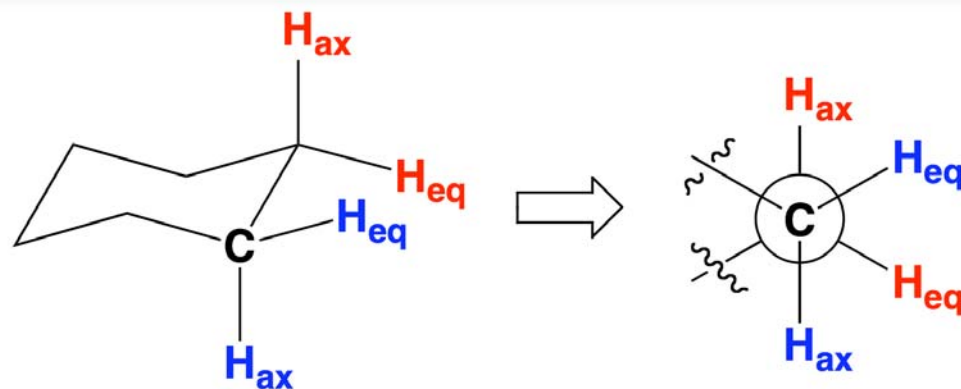
$$(m+1) \cdot (l+1)$$

※ $J_{AM} = J_{AX}$ なら

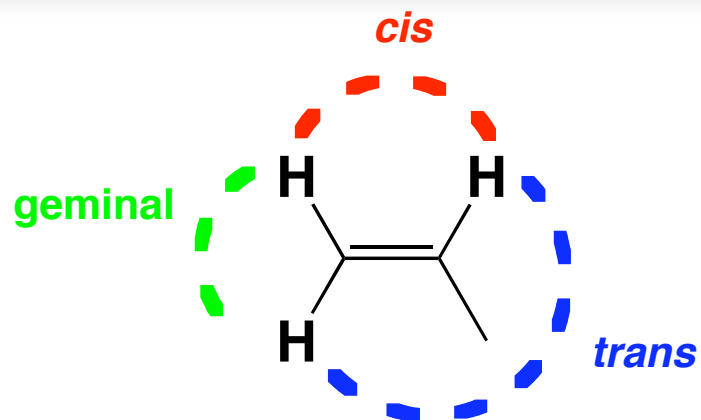
$$(m+l+1)$$



立体化学の決定



$${}^3J_{HH} (\sim 12 \text{ Hz}) \gg {}^3J_{HH} (2\sim 3 \text{ Hz}) \cong {}^2J_{HH} (2\sim 3 \text{ Hz})$$



$${}^3J_{trans} (11\sim 18 \text{ Hz}) > {}^3J_{cis} (6\sim 14 \text{ Hz}) \gg {}^2J_{geminal} (\sim 3 \text{ Hz})$$