Rough calc

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$r_{x,y} = 0.944A$
$r_z = 0.545A$
$I_a = I_b = m_c(3\alpha r_z)^2 + m_H\left[3r_z^2(3\alpha-1)^2 + \frac{3}{2}r_{x,y}^2\right] = 12u\left(\frac{3}{15}0.545A\right)^2 + u\left(3(0.545A)^2\left(\frac{3}{15}-1\right)^2 + \frac{3}{2}(0.944A)^2\right)$
$= (1.425 \times 10^{-1} + 6.4 \times 10^{-1} + 1.3367)uA^2 = 2.119uA^2$
$I_c = 3m_H\left[r_{x,y}^2\right] = 3u[0.944A] = 2.673uA^2$

$6.626070040 \times 10^{-34}\, kg\frac{m^2}{s} \times \frac{1u}{1.6605 \times 10^{-27} kg} \times \left(\frac{10^{10}A}{m}\right)^2 = 3.9904065 \times \frac{10^{-07}um^2}{s}\left(\frac{10^{10}A}{m}\right)^2 = 3.990406528 \times 10^{13}\frac{uA^2}{s} = h$
$h = 3.990406528 \times 10^{13}\frac{uA^2}{s}$
$\hbar = 6.350929239 \times 10^{12}\ \frac{uA^2}{s}$
$c = 29979245800\frac{cm}{s}$
$B_e = \frac{h}{8\pi^2 I_a} = 5.05390 \times 10^{11} \times \frac{1}{2.119uA^2} = 2.3850 \times 10^{11}Hz$
$B_e' = \frac{h}{8\pi^2}\left(\frac{I_a - I_c}{I_a I_c}\right) = 3.990406528 \times 10^{13}\frac{uA^2}{s} \times \frac{1}{8\pi^2}\frac{(2.119uA^2 - 2.673uA^2)}{2.119uA^2 \times 2.673uA^2}$
$= 5.05390 \times 10^{11}\frac{-0.554}{5.664uA^2}$
$= -4.94325 \times 10^{10}Hz$
$\tilde{B}_e = \frac{B_e}{c} = 2.3850 \times 10^{11}Hz \times \frac{1}{29979245800cm\,Hz} \approx 7.9555cm^{-1}$
$\tilde{B}_e' = -4.94325 \times 10^{10}Hz\ \times \frac{1}{29979245800cm\,Hz} \approx -1.648cm^{-1}$
$\tilde{E} = \tilde{B}_e\big(J(J+1)\big) + \tilde{B}_e'K^2$
$g(J, K = 0) = (2J+1)$
$g(J, K \neq 0) = 2(2J+1)$
$k_b = 1.38064852 \times 10^{-23}\ \frac{J}{K}$
$\tilde{k}_b = 1.38064852 \times 10^{-23}\ \frac{J}{K} \times 5.034\,45 \times 10^{22}\frac{cm^{-1}}{J} = 0.69508\frac{cm^{-1}}{K}$

Energy transitions
P: $\Delta E_{rot}(\Delta J = 1, \Delta K) = 2h\tilde{B}_e(J'+1) + h\tilde{B}_e'\left({K''}^2 - {K'}^2\right)$
Q: $\Delta E_{rot}(\Delta J = 0, \Delta K) = h\tilde{B}_e'\left({K''}^2 - {K'}^2\right)$
R: $\Delta E_{rot}(\Delta J = -1, \Delta K) = -2h\tilde{B}_e J + h\tilde{B}_e'\left({K''}^2 - {K'}^2\right)$