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1. For a spinless particle, its wave function reads

$$\psi(x, y, z) = K(x + y + 2z)e^{-\alpha r}, \tag{1}$$

with K and α being real constants. (a) What is the total angular momentum of the particle? (b) What is the expectation value of $\hat{L}_z$? (c) If L_z is measured, what is the probability of obtaining $L_x = \hbar$? (d) Calculate the probability density of finding the particle within the solid angle $d\Omega$.