Here are the more notable corrections and changes made in the paperback edition of *Optically polarized atoms: understanding light–atom interactions*:

- Page v, first paragraph of Acknowledgments, "and Andrey Jarmola"→"Andrey Jarmola, and Kyle Beloy"
- Page 10, Eq. (2.7), write **l** as vector:

$$\mathbf{l}^2 = l_x^2 + l_y^2 + l_z^2.$$

- Page 14, Eq. (2.20), divide by $\hbar$:

$$\boldsymbol{\mu} = -\mu_B \left(\mathbf{l} + 2\mathbf{s}\right)/\hbar.$$

- Page 26, Eq. (2.27), divide by $\hbar$:

$$\boldsymbol{\mu}_I = g_I \mu_N \mathbf{I}/\hbar,$$

- Page 26, last line: replace "can only support multipole moments of rank 2^κ" with "can only support multipole moments of rank κ"
- Page 44, in Eq. (3.69), replace "$\psi'^{m_1} = \mathscr{D}_{m_1 m}\psi^m$." with "$\psi'^{m_1} = \mathscr{D}_{m_1 m_2}\psi^{m_2}$."
- Page 44, in beginning of Eq. (3.70), replace "$|\psi\rangle = \mathscr{D}^{-1}|\psi\rangle'$" with "$|\psi\rangle = \mathscr{D}^{-1}|\psi'\rangle$"
- Page 56, Eq. (4.6), multiply by $-\mu_B/\hbar$:

$$\boldsymbol{\mu} = \boldsymbol{\mu}_L + \boldsymbol{\mu}_S = -\mu_B(g_L\mathbf{L} + g_S\mathbf{S})/\hbar.$$

- Page 57, Eq. (4.7), multiply by -1:

$$\begin{aligned}\mu_J &= \mu_L\cos\alpha + \mu_S\cos\beta\\ &= -\mu_B\sqrt{L(L+1)}\cos\alpha - 2\mu_B\sqrt{S(S+1)}\cos\beta.\end{aligned}$$

- Page 57, Eq. (4.10), multiply by -1:

$$g_J = -\frac{\mu_J}{\mu_B}\frac{\hbar}{|\mathbf{J}|} = 1 + \frac{J(J+1) + S(S+1) - L(L+1)}{2J(J+1)}.$$

- Page 58, before Eq. (4.17), "since $\langle\mathbf{F}\rangle = m_F\hbar$"→"since for an eigenstate of F_z, $\langle\mathbf{F}\rangle = m_F\hbar\hat{\mathbf{z}}$,"
- Page 58, Eq. (4.17), multiply by $\hat{\mathbf{z}}$:

$$\langle\boldsymbol{\mu}\rangle = -g_F\mu_B m_F\hat{\mathbf{z}} = -g_J\mu_B\langle\mathbf{J}\rangle/\hbar,$$

- Page 68, last line of Eq. (4.62), add minus sign to third case:

$$= \delta_{m'm}\langle \xi J \| d \| \xi' J' \rangle \times \begin{cases} \frac{\sqrt{J^2-m^2}}{\sqrt{J(2J+1)(2J-1)}} & \text{for } J' = J-1 \\ \frac{m}{\sqrt{J(J+1)(2J+1)}} & \text{for } J' = J \\ -\frac{\sqrt{(J+1)^2-m^2}}{\sqrt{(J+1)(2J+1)(2J+3)}} & \text{for } J' = J+1 \\ 0 & \text{for } \left|J'-J\right| > 1 \text{ or } J = J' = 0. \end{cases}$$

- Page 69, Eq. (4.67), change first case from 1 to -1:

$$\frac{\alpha_2}{\alpha_0} = \begin{cases} -1 & \text{for } J' = J-1 \\ \frac{2J-1}{J+1} & \text{for } J' = J \\ \frac{-J(2J-1)}{(J+1)(2J+3)} & \text{for } J' = J+1. \end{cases}$$

- Page 86, footnote, “Bluhm et al. (1996)"→“Blum (1996)"
- Page 94, before, in, and following Eq. (5.49), and in Eq. (5.50), replace Γ with $\widehat{\Gamma}$
- Page 94, following Eq. (5.49), change to “Here $\widehat{\Gamma}$ is a diagonal matrix with the population decay rate of each state on the diagonal."
- Page 94, last sentence before Sec. 5.6, “Bluhm et al. (1996)"→“Blum (1996)"
- Page 102, Eq. (5.78), change J to F:

$$\rho_{FF}(\theta,\phi) = \sqrt{\frac{4\pi}{2F+1}} \sum_{\kappa=0}^{2F} \sum_{q=-\kappa}^{\kappa} \langle F F \kappa 0 | F F \rangle \rho^{\kappa q} Y_{\kappa q}(\theta,\phi).$$

- Page 116, first paragraph of Sec. 6.3, “Bluhm et al. 1996"→“Blum 1996"
- Page 144, inline equation in last paragraph, divide by $\hbar$, to read “$H_B = -\boldsymbol{\mu}\cdot\mathbf{B} = \mu_B(\mathbf{L}+2\mathbf{S})\cdot\mathbf{B}/\hbar$”
- Page 149, first partial paragraph: “and μ is the intrinsic magnetic moment”→“and $\boldsymbol{\mu}$ is the intrinsic magnetic moment”
- Page 201, move “where we have used Eq. (7.62) with $\Gamma = 1/\tau$." from after Eq. (10.58d) to after Eq. (10.59d), and swap the period and comma at the ends of Eqs. (10.58d) and (10.59d)
- Page 228, before Sec. 11.6, replace “Grossetete (1965)" with “Grossetête (1964)".
- Page 326, insert “(From Acosta et al. 2008.)" at the beginning of Fig. 18.14 caption

- Page 329, Eq. (19.1), change to

$$\Delta E_{\xi J m} = \frac{\mathcal{E}_0^2}{4} \sum_{\xi' J' m'} \langle \xi J m | d_i | \xi' J' m' \rangle \langle \xi' J' m' | d_j | \xi J m \rangle \times \left(\frac{\varepsilon_i \varepsilon_j^*}{E_{\xi J m} - E_{\xi' J' m'} - \hbar\omega} + \frac{\varepsilon_i^* \varepsilon_j}{E_{\xi J m} - E_{\xi' J' m'} + \hbar\omega} \right),$$

- Page 331, Eq. (19.8), change angle brackets to absolute value:

$$\Delta E_{\xi J m} = \mathcal{E}_0^2 \left[C_0 + C_1 m V_z + C_2 \left(m^2 - \frac{J(J+1)}{3} \right) \left(|\varepsilon_z|^2 - \frac{1}{3} \right) \right].$$

- Page 331, replace passage

It is convenient to define AC-Stark polarizabilities α_κ in terms of the C_κ so that α_0 and α_2 are consistent with the usual definitions for static electric polarizabilities as given by Eq. (4.65).

When extrapolating from low-frequency polarizabilities to static polarizabilities, it is important to take into account the discontinuity related to the fact that the time-averaged value of the square of an oscillating field is one-half of the amplitude squared, and this factor of one-half is absent for a static field.

The second-rank tensor polarizability is defined so that the tensor shift averaged over m is zero and also, if the electric field is applied along $\hat{\mathbf{z}}$, then the tensor shift of the stretched states $m = \pm J$ is $-\alpha_2 \mathcal{E}_0^2$. We adopt a similar convention for the vector term in the AC-Stark case: the vector shift of the $m = J$ state for left circularly polarized light propagating along $\hat{\mathbf{z}}$ is $-\alpha_1 \mathcal{E}_0^2/2$. This leads to the expression:

with

The parameters C_κ are often written in terms of the AC-Stark polarizabilities α_κ, commonly defined so that the scalar and tensor AC polarizabilities, α_0 and α_2, become equal to the corresponding static polarizabilities in the limit of a very-low-frequency linearly polarized field. In making this correspondence, we must remember that the AC-Stark shift is the average shift over an oscillation cycle of the electric field. Thus a low-frequency oscillating field of amplitude $\mathcal{E}_0$ will produce an average AC shift that is one-half as large as the DC shift due to a static field $\mathcal{E}_{\text{static}} = \mathcal{E}_0$, since the average of the square of the oscillating field is $\overline{\mathcal{E}^2} = \mathcal{E}_0^2/2$.

Comparing with the definitions for the static electric polarizabilities as given by Eq. (4.65), and including the factor of one-half, we find that the AC scalar shift should be given by $-\alpha_0 \mathcal{E}_0^2/4$, while the value of α_2 can be specified by fixing the AC tensor shift as $-\alpha_2 \mathcal{E}_0^2/4$ for the stretched states $m = \pm J$ in the special case of a field linearly polarized along $\hat{\mathbf{z}}$. Since there is no vector polarizability in the limit of a static field, its definition is somewhat arbitrary; a commonly used convention is that the vector shift of the $m = J$ state for left circularly polarized light propagating along $\hat{\mathbf{z}}$ is given by $-\alpha_1 \mathcal{E}_0^2/8$. (Note that some variation in the literature may be encountered in the definitions of α_0 and α_2, as well as in the definition of α_1.) Using these definitions, we have the expression:

- Page 331, Eq. (19.9), add a prefactor of 1/2, and an additional factor of 1/2 to the second term:

$$\Delta E_{\xi J m} = -\frac{\mathcal{E}_0^2}{4}\left(\alpha_0 + i\alpha_1 \frac{m}{2J} V_z + \alpha_2 \frac{3m^2 - J(J+1)}{J(2J-1)} \frac{3|\varepsilon_z|^2 - 1}{2}\right).$$

- Page 341, Table A.2, after line "R classical rotation operator" add line "R classical rotation matrix"
- Page 350, in Eqs. (D.38), (D.39) (twice), (D.40), and between Eqs. (D.38) and (D.39), replace "$\tilde{R}$" with "R̃"
- Page 355, replace period at the end of Eq. (E.16) with comma
- Page 359, 3rd line, "different density matrix then"→"different density matrix than"
- Page 360, replace reference

  Acosta, V., Ledbetter, M. P., Rochester, S. M., Budker, D., Jackson-Kimball, D. F., Hovde, D. C., Gawlik, W., Pustelny, S. and Zachorowski, J. (2006). *Physical Review A*, **73**, 053404.

  with

  Acosta, V., Ledbetter, M. P., Rochester, S. M., Budker, D., Jackson Kimball, D. F., Hovde, D. C., Gawlik, W., Pustelny, S., Zachorowski, J. and Yashchuk, V. V. (2006). *Physical Review A*, **73**, 053404.

- Page 361, add new reference between Bluhm, R. and Blushs, K.:

  Blum, K. (1996). *Density Matrix Theory and Applications*. Physics of Atoms and Molecules, Plenum Press, New York, 2nd ed.

- Page 361, replace reference Balabas, M.V. et al. with

  Balabas, M. V., Karaulanov, T., Ledbetter, M. P. and Budker, D. (2010). *Physical Review Letters*, **105**, 070801.

- Page 363, replace pair of references

Ducloy, M. (1973). *Physical Review A*, **8**, 1844.
——— (1976). *Journal of Physics B*, **9**, 357.

with

Ducloy, M. (1976). *Journal of Physics B*, **9**, 357.
Ducloy, M., Gorza, M. P. and Decomps, B. (1973). *Optics Communications*, **8**, 21.

- Page 364, replace reference

Grossetete, F. (1965). *Journal de Physique*, **26**, 26.

with

Grossetête, F. (1964). *Journal de Physique*, **25**, 383.

- Page 367, replace reference

Yashchuk, V., Budker, D. and Zolotorev, M. (1999). *Trapped Charged Particles and Fundamental Physics*, Asilomar, CA, USA, *AIP Conf. Proc.*, vol. 457, pp. 177–81.

with

Yashchuk, V., Budker, D. and Zolotorev, M. (1999). D. Dubin and D. Schneider (eds.), *Trapped Charged Particles and Fundamental Physics*, American Institute of Physics, Asilomar, CA, USA, *AIP Conference Proceedings*, vol. 457, pp. 177–81.