Errata (Fundamentals of Plasma Physics and Controlled Fusion)

page v (in Preface): 'energetc particles' in the 17th line from the bottom → 'energetic particles'.

v: "described in ch.16" in the 11th line from the bottom → "described in ch.17"

v: "described in ch.17" in the 10th line from the bottom → "described in ch.18"

p2: The 10th line from the bottom →
Laplacian ∇^2 becomes $\nabla^2\phi = (1/r^2)(\partial/\partial r)(r^2\partial\phi/\partial r)$ and $\cdots$

p3: "appendix B" in the 25th line from the top → "appendix C".

p10: "Lamor radius of proton" in the table just below Fig.2.4 → "1.02mm"

p24: The eqation in the 2nd line from the bottom →

$$\frac{\mathrm{d}}{\mathrm{d}t}(v_x + qA_x) - q\left(\boldsymbol{v}\cdot\frac{\partial \boldsymbol{A}}{\partial x} - \frac{\partial\phi}{\partial x}\right)$$

p34: The 12-20 lines from the top →
$\cdots$ space. The motion of a particle in phase space is described by Hamilton's equations

$$\frac{\mathrm{d}q_i}{\mathrm{d}t} = \frac{\partial H(q_j, p_j, t)}{\partial p_i}, \qquad \frac{\mathrm{d}p_i}{\mathrm{d}t} = -\frac{\partial H(q_j, p_j, t)}{\partial q_i}. \tag{4.1}$$

When canonical variables are used, an infinitesimal volume in phase space $\varDelta = \delta q_1\delta q_2\delta q_3\delta p_1\delta p_2\delta p_3$ is conserved according to Liouville's theorem, that is,

$$\varDelta = \delta q_1\delta q_2\delta q_3\delta p_1\delta p_2\delta p_3 = \mathrm{const.} \tag{4.2}$$

p40 (5.14) →

$$\boldsymbol{j} = -en_{\mathrm{e}}\boldsymbol{V}_{\mathrm{e}} + Zen_{\mathrm{i}}\boldsymbol{V}_{\mathrm{i}}$$

p42: The 10th line from the bottom → From eq.(5.29), the third term in the left-hand side of eq.(5.37) becomes

p45: The equation in the 11th line →

$$V^4 - (v_{\mathrm{A}}^2 + c_{\mathrm{s}}^2)V^2 + v_{\mathrm{A}}^2 c_{\mathrm{s}}^2\cos^2\theta = 0$$

p71: The 6th line to 11th lines from the top →
parameters $A_k,\ \alpha_k$ of $\omega_k = \omega_{k\mathrm{r}} + i\gamma_k = \omega_k^* A_k \exp i\alpha_k$ ($A_k > 0,\ \alpha_k$ are both real), $\tilde{\boldsymbol{V}}_k$ is expressed by

$$\tilde{\boldsymbol{V}}_k = -i(\boldsymbol{k}\times\boldsymbol{b})\frac{\kappa T_{\mathrm{e}}}{eB}\frac{\tilde{\phi}_k}{\kappa T_{\mathrm{e}}} = -i(\boldsymbol{k}\times\boldsymbol{b})\frac{\kappa T_{\mathrm{e}}}{eB}\frac{\tilde{n}_k}{n_0}\frac{\omega_{kr} + \gamma_k i}{\omega_k^*} = -i(\boldsymbol{k}\times\boldsymbol{b})\frac{\kappa T_{\mathrm{e}}}{eB}\frac{\tilde{n}_k}{n_0}A_k\exp i\alpha_k$$

$$\tilde{V}_{kx} = k_y\frac{\tilde{n}_k}{n_0}\frac{\kappa T_{\mathrm{e}}}{eB}\frac{\gamma_k - \omega_{kr}i}{\omega_k^*} = k_y\frac{\tilde{n}_k}{n_0}\frac{\kappa T_{\mathrm{e}}}{eB}(-iA_k\exp i\alpha_k).$$

Then the diffusion coefficient may be obtained from eq.(7.34) as follows:

$$D = \frac{1}{\kappa_n n_0}\mathrm{Re}(\tilde{n}_k\tilde{V}_{-kx}) = \left(\sum_k \frac{k_y\gamma_k}{\kappa_n\omega_k^*}\left|\frac{\tilde{n}_k}{n_0}\right|^2\right)\frac{\kappa T_{\mathrm{e}}}{eB} = \left(\sum_k \frac{k_y}{\kappa_n}A_k\sin\alpha_k\left|\frac{\tilde{n}_k}{n_0}\right|^2\right)\frac{\kappa T_{\mathrm{e}}}{eB}. \tag{7.38}$$

p71: The 16th to 18th from the top →

$$|\tilde{n}_k| \approx |\nabla n_0|\Delta x \approx \frac{\kappa_n}{k_x}n_0.$$

Δx is the correlation length of the fluctuation and the inverse of the propagation constant k_x in the x direction. Then eqs.(7.35) yields

$$D = \frac{\gamma_k}{\kappa_n^2}\left|\frac{\tilde{n}_k}{n_0}\right|^2 \approx \frac{\gamma_k}{k_x^2} \approx (\varDelta x)^2\gamma_k \approx \frac{(\varDelta x)^2}{\tau_{\mathrm{c}}}, \tag{7.39}$$

where τ_{c} is the autocorrelation time of the fluctuation and is nearly equal to the inverse of γ_k in the saturation stage of the fluctuation.

p71: The 14th line from the bottom →

It appears that eq.(7.40) gives the largeset possible diffusion coefficient.

p86: The 8the line from the bottom → ⋯ of variations $\delta W = 0$, where

p88: Eq.(8.62) →

$$\omega^2 = \frac{B_{0z}^2 k^2}{\mu_0 \rho_{\rm m0}} \left(1 + \frac{B_\theta^2}{B_{0z}^2} \frac{1}{(ka)} \frac{I_1'(ka)}{I_1(ka)} \frac{K_0(ka)}{K_1'(ka)} \right), \qquad (-K_1'(z) = K_0(z) + K_1(z)/z). \tag{8.62}$$

p102: "appendix C" in the 3rd line from the bottom → "appendix B".

p106: ref.18 → 18. J. M. Greene, N. S. Chance: Nucl. Fusion **21**, 453 (1981)

p115: ref.1 → 1. H. P. Furth, J. Killeen and M. N. Rosenbluth: Phys. Fluids: ....

p118: The 15th line from the top → ⋯ Using $\boldsymbol{N}$, we may write eq.(10.17)

p137: The 7th to 3rd lines from the bottom →

$$D_{\rm v}(v) = \left(\frac{e}{m}\right)^2 \int_{-\infty}^{\infty} \frac{i(|E_k|^2/L)\exp(2\gamma(k)t)}{\omega_{\rm r}(k) - kv + i\gamma(k)} {\rm d}k$$
$$= \left(\frac{e}{m}\right)^2 \int_{-\infty}^{\infty} \frac{\gamma(k)(|E_k|^2/L)\exp(2\gamma(k)t)}{(\omega_{\rm r}(k) - kv)^2 + \gamma(k)^2} {\rm d}k$$

where L is equal to the integral range of x for the statistical average.
When $|\gamma(k)| \ll |\omega_{\rm r}(k)|$, the diffusion coefficient in velocity space is

$$D_{\rm v}(v) = \left(\frac{e}{m}\right)^2 \pi \int (|E_k|^2/L)\exp(2\gamma(k)t)\,\delta(\omega_{\rm r}(k) - kv){\rm d}k$$
$$= \left(\frac{e}{m}\right)^2 \frac{\pi}{|v|} (|E_k|^2/L)\exp(2\gamma(k)t)\Big|_{\omega/k=v}. \tag{11.36}$$

p139-p140: "$\boldsymbol{E}(\boldsymbol{r},t)$ and $\boldsymbol{D}(\boldsymbol{r},t)$ by $\boldsymbol{E}_\omega(\boldsymbol{r},t)$ and $\boldsymbol{D}_\omega(\boldsymbol{r},t)$" in the 1st line from the bottom → "$\boldsymbol{E}(\boldsymbol{r},t)$ and $\boldsymbol{D}(\boldsymbol{r},t)$ by $\boldsymbol{E}_\omega(\boldsymbol{k},\omega)$ and $\boldsymbol{D}_\omega(\boldsymbol{k},\omega)$"

p157: "appendix B" in the 14th line from the top → "appendix C".

p157: The 6-5th lines from the bottom →

⋯ frequency ($|\omega| \gg |\Omega|$), then we find $\zeta_n \to \zeta_0$, $n\Omega \to 0$, $\sum I_n(b)\exp(-b) = 1$,

p161: ref.3. → 3. E. G. Harris: *Physics of Hot Plasma*, p.145 (ed. by B. J. Rye and J. B. Taylor) Oliver & Boyd, ⋯

p162: (14.1) →

$$\rho_{\rm m}\gamma^2 \boldsymbol{\xi} = \boldsymbol{j} \times \delta\boldsymbol{B} + \delta\boldsymbol{j} \times \boldsymbol{B} - \nabla\delta p_{\rm c} - \nabla\delta p_{\rm h}. \tag{14.1}$$

p162: Equation in the 8th line from the bottom →

$$\delta\boldsymbol{E}_\perp = \gamma\boldsymbol{\xi} \times \boldsymbol{B}, \qquad \delta\boldsymbol{E}_\parallel = 0, \qquad \delta\boldsymbol{B} = \nabla \times (\boldsymbol{\xi} \times \boldsymbol{B}), \qquad \delta\boldsymbol{j} = \nabla \cdot \delta\boldsymbol{B}.$$

p163: $\frac{\pi B_{\theta{\rm s}}^2}{2\mu_0}|\xi_{\rm s}|\delta\hat{W}_{\rm T}$ in eq.(14.8) → $\frac{\pi B_{\theta{\rm s}}^2}{2\mu_0}|\xi_{\rm s}|^2\delta\hat{W}_{\rm T}$.

p164: $\frac{\pi}{2\mu_0}\frac{B_{\theta{\rm s}}^2}{2\pi}{\rm s}n\gamma\tau_{{\rm A}\theta}$ in eq.(14.13) → $\frac{\pi}{2\mu_0}\frac{B_{\theta{\rm s}}^2}{2\pi}{\rm s}n\gamma\tau_{{\rm A}\theta}|\xi_{\rm s}|^2$.

p164: The 5th and 4th lines from the bottom →

$$\delta F_{\rm h} \equiv \frac{e}{m}\delta\phi\frac{\partial}{\partial E}F_{\rm 0h} + \delta H_{\rm h}, \quad \left(v_\parallel\frac{\partial}{\partial l} - i(\omega - \hat{\omega}_{\rm dh})\right)\delta H_{\rm h} = i\frac{e}{m}Q(\delta\phi - v_\parallel\delta A_\parallel) \tag{14.15}$$

where $\delta A_\parallel = (-i/\omega)\partial\delta\phi/\partial l$ due to $E_\parallel = 0$ (see eq.(14.43) and

p164: Equations in the 2nd line from the bottom →

$$\boldsymbol{v}_{\rm dh} \equiv \left(v_\parallel^2 + \frac{v_\perp^2}{2}\right)\frac{m}{eB}(\boldsymbol{b} \times \boldsymbol{\kappa}), \qquad \hat{\omega}_{*{\rm h}} \equiv -i\omega_{\rm c}^{-1}\frac{\boldsymbol{b} \times \nabla F_{\rm 0h}}{F_{\rm 0h}} \cdot \nabla \approx \frac{-m}{eBr}\frac{\partial}{\partial r}.$$

p165: The 5th line from the top →

$$v_\parallel\frac{\partial\delta H_{\rm h}}{\partial l} = i(\omega - \hat{\omega}_{\rm dh})\delta G_{\rm h} + i\frac{\hat{\omega}_{\rm dh}}{\omega}\frac{e}{m}Q\delta\phi - \frac{1}{\omega}\frac{e}{m}v_\parallel\frac{\partial\delta\phi}{\partial l}Q.$$

p167: "initial velocity $v_{\rm mx}^2 = E_{\rm mx}$" in the 8th line from the top → "initial velocity $v_{\rm mx}^2/2 = E_{\rm mx}$"

p172: The 2nd and 3rd lines from the top →

$$\phi_1(r,\theta,\zeta,t) = \sum_{\rm m} \phi_{\rm m}(r) \exp i(-{\rm m}\theta + {\rm n}\varphi - \omega t), \quad (\boldsymbol{b}\cdot\nabla)\phi_{\rm m} = \frac{i}{R_0}\left({\rm n} - \frac{\rm m}{q(r)}\right)\phi_{\rm m} = ik_{\|{\rm m}}\phi_{\rm m},$$

$$k_{\|{\rm m}} = \frac{1}{R_0}\left({\rm n} - \frac{\rm m}{q(r)}\right), \quad E_{\rm m} \equiv \frac{\phi_{\rm m}}{R},$$

p173: (14.55) →

$$m_{\rm j}\frac{\partial}{\partial t}(n_{\rm j}\boldsymbol{u}_{\rm j}) + \nabla\cdot P_{\rm j} = q_{\rm j}n_{\rm j}(\boldsymbol{E} + \boldsymbol{u}_{\rm j}\times\boldsymbol{B}), \tag{14.55}$$

p173: equation number ((14.58)) → (14.58)

p175: (14.66) →

$$s_{\rm j} = \int_{-\infty}^{t}\left(\frac{v_\perp^2}{2}\nabla\cdot\boldsymbol{\xi}_\perp + \left(\frac{v_\perp^2}{2} - v_\|^2\right)\boldsymbol{\xi}\cdot\boldsymbol{\kappa}\right){\rm d}t' \tag{14.66}$$

p175: (14.67) →

$$P_{1{\rm j}} = \int m_{\rm j}\boldsymbol{v}\boldsymbol{v}f_{1{\rm j}}{\rm d}\boldsymbol{v} = P_{1\perp{\rm j}}I + (P_{1\|{\rm j}} - P_{1\perp{\rm j}})\boldsymbol{b}\boldsymbol{b} \tag{14.67}$$

p175: (14.70) →

$$\boldsymbol{D}_\perp(\boldsymbol{\xi}_\perp) = m_{\rm j}\int\left(\frac{v_\perp^2}{2}\nabla_\perp + \left(v_\|^2 - \frac{v_\perp^2}{2}\right)\boldsymbol{\kappa}\right)m_{\rm j}(\omega - \omega_{*{\rm j}})\frac{\partial F_{\rm j}}{\partial\varepsilon}s_{\rm j}{\rm d}\boldsymbol{v}. \tag{14.70}$$

p176: The equation in the 5th line from the top →

$$\frac{{\rm d}s_{\rm j}^*}{{\rm d}t} = \left(\frac{v_\perp^2}{2}\nabla_\perp\cdot\boldsymbol{\xi}^* + \left(\frac{v_\perp^2}{2} - v_\|^2\right)\boldsymbol{\xi}_\perp\cdot\boldsymbol{\kappa}\right).$$

p177: Eq.(14.76) →

$$K_{\rm M} = \frac{r_0^2\rho_0}{2}\int\left(\frac{|\xi_{\rm m}'|^2}{{\rm m}^2} + \frac{|\xi_{\rm m+1}'|^2}{({\rm m}+1)^2}\right){\rm d}\boldsymbol{r}. \tag{14.76}$$

p178: The equation in the 7tn line from the top →

$$F_{\rm j} = n_{\rm j}\left(\frac{m_{\rm j}}{2\pi T_{\rm j}}\right)^{3/2}\exp\left(-\frac{m_{\rm j}v^2}{2T_{\rm j}}\right).$$

p178: "single parameter $\lambda_{\rm j} \equiv v_{\rm A}/v_{\rm Tj}$" in the 13th line from the top → "single parameter $\lambda_{\rm j} \equiv v_{\rm A}/v_{\rm Tj}$ ($v_{\rm Tj}^2 \equiv 2T_{\rm j}/m_{\rm j}$)"

p179: The equations in the 2nd line →

$$\beta_\alpha = \frac{p_\alpha}{B^2/2\mu_0}, \quad \delta_\alpha = -\frac{2}{3}r_{{\rm L}\alpha}\frac{{\rm d}p_\alpha/{\rm d}r}{p_\alpha}, \quad r_{{\rm Lp}\alpha} = \frac{m_\alpha v_\alpha}{q_\alpha B_{\rm p}}.$$

p179: The equations in the 4th and 3rd lines from the bottom →

$$\overline{\boldsymbol{v}\boldsymbol{v}} = v_\|^2\boldsymbol{b}\boldsymbol{b} + v_\perp^2\overline{\cos(\Omega t)^2}\hat{\boldsymbol{e}}_\perp\hat{\boldsymbol{e}}_\perp + v_\perp^2\overline{\sin(\Omega t)^2}(\boldsymbol{b}\times\hat{\boldsymbol{e}}_\perp)(\boldsymbol{b}\times\hat{\boldsymbol{e}}_\perp)$$

$$= (v_\|^2 - v_\perp^2/2)\boldsymbol{b}\boldsymbol{b} + (v_\perp^2/2)(\boldsymbol{b}\boldsymbol{b} + \hat{\boldsymbol{e}}_\perp\hat{\boldsymbol{e}}_\perp + (\boldsymbol{b}\times\hat{\boldsymbol{e}}_\perp)(\boldsymbol{b}\times\hat{\boldsymbol{e}}_\perp)) = (v_\|^2 - v_\perp^2/2)\boldsymbol{b}\boldsymbol{b} + (v_\perp^2/2)I,$$

p186: "Fig.14.1" in the top line in the figure caption→ "Fig.15.1".

p193: (16.3) →

$$\psi(\rho,\omega) = \frac{\mu_0 I_{\rm p}}{2\pi}R\left(\ln\frac{8R}{\rho} - 2\right) - \frac{\mu_0 I_{\rm p}}{4\pi}\left(\ln\frac{\rho}{a} + \left(\Lambda + \frac{1}{2}\right)\left(1 - \frac{a^2}{\rho^2}\right)\right)\rho\cos\omega. \tag{16.3}$$

p193: Λ of the 11th line from the top → $\Lambda = \beta_{\rm p} + l_{\rm i}/2 - 1$

p197: 'Greenward' in the top line → 'Greenwald'.
p198: The 8th line from the bottom → $\cdots\ \beta_N \sim 3.6,\ \kappa_s = 2.35$ and $\cdots$
p200: "energy loss by charge exchange" in the 3rd line from the bottom → "ion loss by charge exchange"
p202: (16.29) →

$$\phi_{\rm D} \approx \frac{(1-f_{\rm rad})P_{\rm sep}}{2\pi R 2\lambda_{\phi D}} = (1-f_{\rm rad})\pi K \frac{a}{\lambda_T} q_\perp \left(1.5 + \frac{\lambda_T}{\lambda_n}\right)\frac{B_{\theta {\rm D}}}{B_\theta} \quad (16.29)$$

p203: The 10th line from the bottom → ($f = 1$ in the Pfirsch-Schlüter region and $f = \epsilon_{\rm t}^{-3/2}$ in the banana region)
p217: The 15th line from the top →

$$\eta_{\rm NB} \equiv \frac{R n_{\rm e19} J}{2\pi R P_{\rm d}} \left(10^{19} \frac{\rm A}{\rm W m^2}\right)$$

p219: "$w_z = \nabla \boldsymbol{v}$" in the 15th line from the top → "$w_z = (\nabla \times \boldsymbol{v})_z$".
p219: (16.71) →

$$\psi(x,y,t) = \psi_0(x) + \tilde{\psi}(y,t) = B'_{0y}\frac{x^2}{2} + \frac{B_{1x}(t)}{k}\cos ky = \frac{B'_{0y}}{2}x^2 + \tilde{\psi}_{\rm A}(t)\cos ky \quad (16.71)$$

p220: "indicated on fig.16.22" in the 4th line from the top → "indicated on fig.16.21"
p221: (16.74) →

$$x = \left(\frac{2}{B'_{0y}}(\psi - \tilde{\psi})\right)^{1/2} = \left(\frac{2}{B'_{0y}}\right)^{1/2} \tilde{\psi}_{\rm A}^{1/2}(W - \cos ky)^{1/2}, \qquad W \equiv \frac{\psi}{\tilde{\psi}_{\rm A}} \quad (16.74)$$

p221: (16.76) →

$$\varDelta' \tilde{\psi}_{\rm A} = 2\mu_0 \left\langle \cos ky \int_{-\infty}^{\infty} j_{1z} {\rm d}x \right\rangle, \qquad {\rm d}x = \left(\frac{1}{2B'_{0y}}\right)^{1/2} \frac{{\rm d}\psi}{(\psi - \tilde{\psi})^{1/2}}. \quad (16.76)$$

p222: The equation in the 2nd and 3rd lines from the top →

$$\varDelta' \tilde{\psi}_{\rm A} = 2\frac{\mu_0}{\eta} \int_{x=-\infty}^{x=\infty} \left\langle \frac{\partial \tilde{\psi}/\partial t}{(\psi - \tilde{\psi})^{1/2}} \right\rangle \left\langle (\psi - \tilde{\psi})^{-1/2} \right\rangle^{-1} \left\langle \left(\frac{1}{2B'_{0y}}\right)^{1/2} \frac{\cos ky}{(\psi - \tilde{\psi})^{1/2}} \right\rangle {\rm d}\psi$$

$$= \frac{4\mu_0}{\eta (2B'_{0y})^{1/2}} \int_{\psi_{\rm min}}^{\infty} {\rm d}\psi \frac{\partial \tilde{\psi}_{\rm A}}{\partial t} \left\langle \frac{\cos ky}{(\psi - \tilde{\psi})^{1/2}} \right\rangle \left\langle (\psi - \tilde{\psi})^{-1/2} \right\rangle^{-1} \left\langle \frac{\cos ky}{(\psi - \tilde{\psi})^{1/2}} \right\rangle.$$

p222: The equation in the 5th line from the top →

$$\int {\rm d}\psi \left\langle \frac{\cos ky}{(\psi - \tilde{\psi})^{1/2}} \right\rangle^2 \frac{1}{\left\langle (\psi - \tilde{\psi})^{-1/2} \right\rangle} = \int \left\langle \frac{\cos ky}{(W - \cos ky)^{1/2}} \right\rangle^2 \frac{{\rm d}W \tilde{\psi}_{\rm A}^{1/2}}{\left\langle (W - \cos ky)^{-1/2} \right\rangle} \equiv A \tilde{\psi}_{\rm A}^{1/2}$$

p222, p223: The sentence in the figure caption of Fig.16.23 in p222 and the sentence in the 1st-3rd lines from the top of p223 should be "The coordinates (x, y, z) in slab model correspond radial direction $(r - r_{\rm s})$, poloidal direction $(\sim r\theta)$ and the direction of the magnetic field at the rational surface in the toroidal plasma respectively."
p223: (16.78) →

$$\psi(x,y) = \int_0^{r - r_{\rm s}} \left(\frac{1}{q(r)} - \frac{1}{q_{\rm s}}\right) \frac{r}{R} B_{\rm t} {\rm d}x + \frac{B_{1x}}{k}\cos ky \quad (16.78)$$

p223: The 5th line from the bottom →

$$\varDelta'_{\rm b} r_{\rm s} = \frac{16\mu_0}{w^2 B'_{0y}} \left(\frac{\epsilon_{\rm s}^{1/2}}{B_{\rm p}} \frac{{\rm d}p}{{\rm d}r}\right)_{r_{\rm s}} w r_{\rm s} = \frac{8 r_{\rm s}}{w} \frac{p}{B_{\rm p}^2/2\mu_0} \epsilon_{\rm s}^{1/2} \frac{L_q}{L_p}, \qquad B'_{0y} = -\frac{q'}{q} B_{\rm p} \equiv -\frac{B_{\rm p}}{L_q}, \qquad \frac{{\rm d}p}{{\rm d}r} \equiv -\frac{p}{L_p}.$$

p225: The 4th line from the bottom → and $j(r) = 0, \rho(r) = 0, q(r) = q(r)$ for $r > a$. $\cdots$

p226: (16.86) →

$$\cdots\cdots\ \psi(r) = \frac{\psi(d)}{1-\alpha_{\rm res}}\left((r/d)^{-{\rm m}} - \alpha_{\rm res}(r/d)^{\rm m}\right), \quad (d > r > a). \tag{16.86}$$

p227: (16.86′) →

$$\frac{\psi'(a_+)}{\psi(a)} = -\frac{\rm m}{a}\,\frac{1+\alpha_{\rm res}(a/d)^{2{\rm m}}}{1-\alpha_{\rm res}(a/d)^{2{\rm m}}}. \tag{16.86′}$$

p227: (16.88) →

$$\gamma_{\rm res}(d)^2 = \frac{\gamma_{\rm c}^2(\infty) + R\gamma_{\rm c}^2(d)}{1+R}. \tag{16.88}$$

p227: The 15th line from the bottom →
$\cdots$ that is, $\gamma_c^2(d) < 0$ and $\gamma_c^2(\infty) > 0$. $\cdots$

p227: The 4th line from the bottom →

$$\gamma \to \gamma + i\boldsymbol{k}\cdot\boldsymbol{v} = \gamma + i\left(\frac{\rm n}{R}v_z - {\rm m}\omega_\theta\right) = \gamma + i\omega_{\rm rot} \text{ on the left−hand side of (16.88),}$$

p230: "given by $\psi = -rB_{1r}/{\rm m}$" in the 4th line from the top → "given by $\psi = irB_{1r}/{\rm m}$"

p231: The equation in the 7th line from the bottom →

$$\beta_{\rm th} \equiv \frac{\langle p\rangle}{B_{\rm t}^2/2\mu_0} = 0.0403(1 + f_{\rm DT} + f_{\rm He} + f_{\rm I})\frac{\langle n_{20}T\rangle}{B_{\rm t}^2}$$

p232: The 12th line from the bottom →
$n(\rho) = \langle n\rangle\ (1-\rho^2)^{\alpha_n}(1+\alpha_n), \quad T(\rho) = \langle T\rangle(1-\rho^2)^{\alpha_T}(1+\alpha_T)$ is shown in fig.16.30[55].

p233: The equation in the 2nd line →

$$P = (1 - f_{\rm R})\left(f_\alpha + \frac{5}{Q}\right)P_\alpha.$$

p233: "the inverse aspect ratio A" in the 7th line from the top →
"the aspect ratio A"

p236: The equation in the 1st line from the top →

$$R_{\rm OH} = R - (a + \Delta + d_{\rm TF} + d_{\rm s} + d_{\rm OH})$$

p236: ref.16. → 16. T. N. Todd: in Tokamak Programme Workshop (Proc. 2nd Eur. Workshop, Sault-Les-Chrtreaux, 1983) European Physical Society, Geneva (1983) 189
Y. Kamada, K. Ushigusa, O. Naito, Y. Neyatani, T. Ozeki *et al*: Nucl. Fusion **34**, 1605 1994

p236: ref.20. → 20. P. N. Yushmanov, T. Takizuka, K. S. Riedel, $\cdots$
N. A. Uckan, P. N. Yushmanov, T. Takizuka, K. Borras, J. D. Callen, *et al*: $\cdots$

p237: ref.25. → 25. S. I. Itoh and K. Itoh: Phys. Rev. Lett. **60**, 2276 (1988)

p237: In ref.41, "K. Okano: Nucl. Fusion **30**, 423 (1990)" should be added.

p239: "in eq.(17.1)" in the 8th line from the top → "in eq.(17.2)"

p244: "in fig.14.13" in the 8th line from the bottom → "in fig.17.3"

p246: The 5th line from the top → then $\iota_2(r) = \iota_0 + \iota_2(r/a)^2 + \ \cdots$

p247: In the figure caption of Fig.17.6, (R=3.9m, a$\sim$ 0.6, B = 3T) → (R=3.9m, a$\sim$ 0.6m, B = 3T).

p252: Equation number (17.27) in the 3rd line from the bottom shoud be deleted.

p254: "*instability* occurs[53]" in the 3rd line from the top → "*instability* occurs[54]"

p255: The equation number in the 2nd line from the top → (17.34) instead of (17.44).

p258: ref.22. → 22. E. D. Andryukhina, G. M. Batanov, M. S. Berezhetskij, M. A. Blokh, G. S. Vorosov *et al.*: $\cdots$

p258: ref.24. → 24. L. Garcia, B. A. Carreras, J. H. Harris, H. R. Hicks and V. E. Lynch:

Nucl. Fusion **24**, 115 (1984)

p258: ref.25. → 25. Yu. N. Petrenko and A. P.Popryadukhin: 3rd International Symp. on Toroidal Plasma Confinements, D8, (1973, Garching)

p259: ref.45. → 45. D. V. Sivukhin: Reviews of Plasma Physics ⋯
p259: ref.48. → 48. Yu. T. Baiborodov, M. S. Ioffe, B. I. Kanaev, R. I. Sobolev, and E. E.Yushmanov: Plasma Phys. Contr. Fusion Res. (Conf. Proceedings, Madison 1971) **2**, 647 (1971)

p263: The 7th line from the top → "the transport process of particles and the energy, and motion of the plasma fluid."
p268: The second term of the righthand side of (A.8) →

$$\langle v_i\rangle \sum_j \frac{\partial}{\partial x_j}(n\langle v_j\rangle)$$

p269: The lefthand side of (A.15) →

$$\frac{\partial}{\partial t}\left(\frac{nm}{2}\langle v^2\rangle\right)+\nabla_{\rm r}\left(\frac{n}{2}m\langle v^2\boldsymbol{v}\rangle\right) =$$

p269: The lefthand side of the equation in the 11th line from the top →

$$\langle v^2\boldsymbol{v}\rangle =$$

p269: The lefthand side of the equation in the 8th line from the bottom →

$$\langle v^2\boldsymbol{v}\rangle =$$

p272: "energy integral (B.2)" in the 12th line from the top → "energy integral (B.1)"
p272: The 8 th line from the bottom →

$$= \frac{1}{2}\int_V\left(\gamma p(\nabla\cdot\boldsymbol{\xi}) + \frac{1}{\mu_0}\left|\boldsymbol{B}_1 - \frac{\mu_0(\boldsymbol{\xi}\cdot\nabla p)}{B^2}\boldsymbol{B}\right|^2 - \frac{(\boldsymbol{j}\cdot\boldsymbol{B})}{B^2}(\boldsymbol{\xi}_\perp\times\boldsymbol{B})\cdot\boldsymbol{B}_1\right.$$

p276: $(\nabla p)(\nabla\cdot\boldsymbol{\xi}^*)$ in the top line → $(\boldsymbol{\xi}\cdot\nabla p)(\nabla\cdot\boldsymbol{\xi}^*)$.
p278: "refer (B.13)" in the top line → "refer (B.16)"
p278: The equations in the 12th, 15th and 16th lines from the top →

$$-\frac{2J\mu_0 p'}{B^2}\left(|X|^2\frac{\partial}{\partial\psi}(\mu_0 p + \frac{B^2}{2}) - \frac{i\hat{I}}{JB^2}\frac{\partial}{\partial\chi}\left(\frac{B^2}{2}\right)\frac{X^*}{n}\frac{\partial X}{\partial\psi}\right)$$

$$P = X\sigma - \frac{B_\chi^2}{\hat{q}B^2}\frac{I}{n}\frac{\partial}{\partial\psi}(JBk_\parallel X)$$

$$Q = \frac{X\mu_0 p'}{B^2} + \frac{\hat{I}^2}{\hat{q}^2R^2B^2}\frac{1}{n}\frac{\partial}{\partial\psi}(JBk_\parallel X)$$

p279: The 3rd to 9th line from the top →

$$X_s(\psi) = \int_{-\infty}^{\infty}\hat{X}(\psi,y)\exp(isy)\mathrm{d}y/(2\pi), \qquad \hat{X}(\psi,y) = \int_{-\infty}^{\infty}X_s(\psi)\exp(-isy)\mathrm{d}s.$$

$\hat{X}(\psi,y)$ is called by the ballooning representation of $X(\psi,\chi)$. Then $X(\psi,\chi)$ is reduced to

$$X(\psi,\chi) = \sum_m \exp(-im\chi)\int_{-\infty}^{\infty}\hat{X}(\psi,y)\exp(imy)\mathrm{d}y/(2\pi). \qquad \text{(B.21)}$$

Since

$$\frac{1}{2\pi}\sum_m \exp(-im(\chi-y)) = \sum_N \delta(y-\chi+2\pi N)$$

($\delta(x)$ is δ function), the relation of $X(\psi,\chi)$ and $\hat{X}(\psi,y)$ is

$$X(\psi,\chi)=\sum_N \hat{X}(\psi,\chi-2\pi N). \tag{B.22}$$

p279: J. W. Connor, R. J. Hastie and J. B. Talor in Ref.3 and 4 → J. W. Connor, R. J. Hastie and J. B. Taylor

p284: The matrix S_{jn} in (C.27) →

$$S_{j\mathrm{n}}=\begin{bmatrix} v_\perp(\mathrm{n}\frac{J_\mathrm{n}}{a})^2U & -iv_\perp(\mathrm{n}\frac{J_\mathrm{n}}{a})J'_\mathrm{n}U & v_\perp(\mathrm{n}\frac{J_\mathrm{n}}{a})J_\mathrm{n}(\frac{\partial f_0}{\partial v_z}+\frac{\mathrm{n}}{a}W) \\ iv_\perp J'_\mathrm{n}(\mathrm{n}\frac{J_\mathrm{n}}{a})U & v_\perp(J'_\mathrm{n})^2U & iv_\perp J'_\mathrm{n}J_\mathrm{n}(\frac{\partial f_0}{\partial v_z}+\frac{\mathrm{n}}{a}W) \\ v_zJ_\mathrm{n}(\mathrm{n}\frac{J_\mathrm{n}}{a})U & -iv_zJ_\mathrm{n}J'_\mathrm{n}U & v_zJ^2_\mathrm{n}(\frac{\partial f_0}{\partial v_z}+\frac{\mathrm{n}}{a}W) \end{bmatrix}$$

p284: The 9th line from the bottom →

$$\sum_{\mathrm{n}=-\infty}^{\infty}J_\mathrm{n}^2=1,\quad \sum_{\mathrm{n}=-\infty}^{\infty}J_\mathrm{n}J'_\mathrm{n}=0,\quad \sum_{\mathrm{n}=-\infty}^{\infty}\mathrm{n}J_\mathrm{n}^2=0\quad (J_{-\mathrm{n}}=(-1)^\mathrm{n}J_\mathrm{n})$$

p286: The 15th line from the bottom →

$$\alpha\equiv\frac{k_xv_{\mathrm{T}\perp}}{\Omega},\quad v_{\mathrm{T}z}^2\equiv\frac{\kappa T_z}{m},\quad v_{\mathrm{T}\perp}^2\equiv\frac{\kappa T_\perp}{m},$$

p288: The 2nd line from the bottom →

$$\int_{-\infty}^{t}\phi_1(\boldsymbol{r}',t')\mathrm{d}t'$$

p289: The 2nd line from the top →

$$\cdots\left[2\frac{\partial f_0}{\partial\alpha}-\left(2(\omega-k_zv_z)\frac{\partial f_0}{\partial\alpha}+2k_z(v_z-V)\frac{\partial f_0}{\partial\beta}+\frac{k_x}{\Omega}\frac{\partial f_0}{\partial\gamma}\right)\sum\frac{(J_\mathrm{n}^2(a)+\cdots)}{\omega-k_zv_z-\mathrm{n}\Omega}\right]. \tag{C.43}$$

p289: The 6th line from the top →

$$-\left(2(\omega-k_zv_z)\frac{\partial f_0}{\partial\alpha}+2k_z(v_z-V)\frac{\partial f_0}{\partial\beta}+\frac{k_x}{\Omega}\frac{\partial f_0}{\partial\gamma}\right)$$

p289: The 5th line from the top → $(k_x^2+k_z^2-\partial^2/\partial y^2)\phi_1=\cdots\cdots$

p289: The 9th line from the top → For $|(k_x^2+k_z^2)\phi_1|\gg|\partial^2\phi_1/\partial y^2|$, eq.(C.44) is $\cdots\cdots$

p301: Add the following sentences below the last line
Note that the x direction is opposite to the electron drift velocity $\boldsymbol{v}_\mathrm{de}$, y is the direction of negative density gradient and the z is the direction of the magnetic field.

Index: Numbers of chapters, sections of following items →

p294: Electric polaization→ Electric polarization

p294: Greenward normalized density→ Greenwald normalized density

p294: Greenward-Hugill-Murakami→ Greenwald-Hugill-Murakami