Errata (Plasma Physics and Controlled Nuclear Fusion) Springer 2005

p5: The 12th line from the bottom line should be

$$\nabla^2\phi = \frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial\phi}{\partial r}\right)$$

p43: The 11th line from the top should be
Accordingly, within accuracy of the 1st order of $\cdots$

p45: The equation in the 7th line from the bottom should be

$$v_x = -iv_\perp \exp(-i\Omega t) + v_{\rm p}, \quad v_y = v_\perp \exp(-i\Omega t) + v_{\rm E}.$$

p47: From the 11th line from the bottom to p48 the 2nd line from the top should be

$\cdots$ More generally, the particle can be specified by *canonical variables* $q_1, q_2, q_3, p_1, p_2, p_3$ and t in phase space. The motion of a particle in phase space is described by Hamilton's equations

$$\frac{{\rm d}q_i}{{\rm d}t} = \frac{\partial H(q_j, p_j, t)}{\partial p_i}, \qquad \frac{{\rm d}p_i}{{\rm d}t} = -\frac{\partial H(q_j, p_j, t)}{\partial q_i}, \qquad (i, j = 1, 2, 3). \tag{4.1}$$

When canonical variables are used, an infinitesimal volume in phase space $\Delta = \delta q_1\delta q_2\delta q_3\delta p_1\delta p_2\delta p_3$ is conserved according to Liouville's theorem, that is, (see fig.4.1)

$$\frac{{\rm d}\Delta}{{\rm d}t} = 0. \tag{4.2}$$

p53: (5.14) should be

$$j = -en_{\rm e}V_{\rm e} + Zen_{\rm i}V_{\rm i}$$

p59: The equation in the bottom line should be

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

p.62 Eq.(6.11). 1+ ...

p104: The 11th line from the top should be
the calculus of variations $\delta W = 0$, where

p123: The equation in the bottom line should be

$$X \equiv RB_\chi \xi_\psi, \quad Y \equiv \frac{\xi_\chi}{B_\chi}, \quad U \equiv \frac{1}{RB_\chi}(B_\chi\xi_\varphi - B_\varphi\xi_\chi) = \frac{\xi_\varphi}{R} - \frac{\hat{I}}{R^2 B_\chi}\xi_\chi$$

p131: The 7th line from the top should be
$\cdots$ stable. The stability condition for the ballooning mode is given by [8.19]

p140: The equation in the 11th line from the top should be

$$F(x) = F_{\rm s}x/L_{\rm s} \;\; (|x| < L_{\rm s}), \qquad F(x) = F_{\rm s}x/|x| \;\; (|x| > L_{\rm s}),$$

p140: The 10th line from the bottom should be
$L_{\rm s} = (F_{\rm s}/F')_{x=0}$. For more general cases $\cdots$

p160: (10.64b) should be

$$\frac{k_\perp^2}{k_\parallel^2} = \frac{(\omega/v_{\rm A}k_\parallel)^4 - 2(\omega/v_{\rm A}k_\parallel)^2 - (\omega/\Omega_{\rm i})^2 + 1}{(\omega/v_{\rm A}k_\parallel)^2 - (1 - \omega^2/\Omega_{\rm i}^2)} \tag{10.64b}$$

p175: The 3rd and 7th lines should be →

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

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

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

p210: The equation in the 1st to 3rd lines from the bottom should be

$$k_x^2+k_z^2+\sum_{\mathrm{i,e}}\frac{\Pi^2}{\omega^2}\Bigg\{k_z^2 2\eta_0^2\lambda_{\mathrm{T}}$$
$$+\sum_{\mathrm{n}=-\infty}^{\infty}\left[\frac{\mathrm{n}^2 I_{\mathrm{n}}}{b}k_x^2-(2\lambda_{\mathrm{T}})^{1/2}\eta_{\mathrm{n}}\frac{\mathrm{n}}{\alpha}I_{\mathrm{n}}2k_xk_z+2\lambda_{\mathrm{T}}\eta_{\mathrm{n}}^2I_{\mathrm{n}}k_z^2\right]$$
$$\times\left[\zeta_0 Z(\zeta_{\mathrm{n}})-\left(1-\frac{1}{\lambda_{\mathrm{T}}}\right)(1+\zeta_{\mathrm{n}}Z(\zeta_{\mathrm{n}}))\right]e^{-b}\Bigg\}=0.$$

p224: The 3rd line from the bottom should be
given by (10.64b), showing ......

p231: (13.67) should be

$$=-\frac{\partial F_{\mathrm{j}}}{\partial\psi}(\xi\cdot\nabla\psi)+im_{\mathrm{j}}(\omega-\omega_{*\mathrm{j}})\frac{\partial F_{\mathrm{j}}}{\partial\epsilon}(\boldsymbol{\xi}_\perp\cdot\boldsymbol{v}-s_{\mathrm{j}}) \tag{13.67}$$

p232: The equation in the 11th line should be

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

p235: The 13th line from the top →

$$A\approx\frac{n_\alpha}{4\pi\ln(v_\alpha/v_0)},\qquad p_\alpha\approx\frac{n_\alpha m_\alpha v_\alpha^2/2}{3\ln(v_\alpha/v_0)},\qquad \frac{m_{\mathrm{j}}v_0^2}{2}\approx T_{\mathrm{j}}.$$

p237: The 1st and 2nd lines from the bottom should be
Alfvén eigenmodes (EAE) [13.8]; likewise for triangularity-induced Alfvén eigenmodes (NAE) [13.8] at about three times the TAE frequency.

p245: The bottom line should be
function $f=-(q/T)\Phi F_0+h$ and $\omega_{*v}=[1+\eta(v^2/2v_{\mathrm{T}}^2-3/2)]\omega_*$, with

p270: Λ in the second line from the bottom should be

$$\Lambda = \beta_p + l_i/2 - 1$$

p274: The 13th and 12th lines from the bottom should be

denoted by $2\pi aK$ for the elongated plasma, the average of poloidal field is $\bar{B}_p = \mu_0 I_p/(2\pi aK)$, where K is approximately given by $K = [(1 + (b/a)^2)/2]^{1/2}$. The ratio of the poloidal and toroidal field is $\bar{B}_p/B_t = Ka/(Rq)$.

p275: The second line from the bottom should be

$\cdot$. With Greenwald dencity defined by

p283: The 1st line from the top should be

an empirical scaling of the normalized Greenwald density or Greenwald-

p286: The 18th line from the top should be

at around $T \sim 10$keV (see Sec.16.10). It is interesting to note $\cdots$

p291: (16.39) should be

$$\tau_{\rm E,th}^{\rm IPB98y2} = 0.0562 I_p^{0.93} B_t^{0.15} P^{-0.69} M_i^{0.19} R^{1.97} \bar{n}_{e19}^{0.41} \epsilon^{0.58} \kappa^{0.78} \qquad (16.39)$$

p309: The equation in the 3rd line from the top should be

$$B_p - \frac{{\rm n}r}{{\rm m}R} B_t = \left(\frac{1}{q(r)} - \frac{1}{q_s}\right) \frac{r}{R} B_t, \qquad \left(q_s = \frac{\rm m}{\rm n}\right)$$

p313: The equation in the 4th line from the top should be

$$n(\rho) = (1 + \alpha_n)\langle n\rangle(1 - \rho^2)^{\alpha_n}, \qquad T(\rho) = (1 + \alpha_T)\langle T\rangle(1 - \rho^2)^{\alpha_T}$$

p330: Figure caption of Fig. 17.6 should be

Fig.17.6 *Upper*: schematic view of the LHD device in Toki (R=3.9m, $a \sim$ 0.6m, B=3T) [17.48]. *Lower*: modular coil system and a magnetic surface of the optimized stellerator Wendelstein 7-X under the construction in Greifswald (R=5.5m, a=0.55m, B=3T) [17.47].

p341: The 10th line from the bottom should be

$\cdots$ The value of the fuel radius is chosen as $r_f = 0.03$cm.

p341: The 7th and 6th lines from the bottom should be

$\cdots$ for $f_B \sim 0.34$ ($\beta(T) \sim 12$g/cm^2 for $\kappa T \sim 17$keV).

p355: Ref.8.21 should be

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p368: Greenward density→ Greenwald density

p368: Greenward-Hugill-Murakami parameter density→ Greenwald-Hugill-Murakami parameter density

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p70: 'Greenward' in the 26th, 28th and 29th lines from the top should be 'Greenwald'.

p103: 'Greenward' in the 8th lines from the top should be 'Greenwald'.

p114: The equations in the 2nd line from the top should be

$$r = \frac{R_0(1-\psi^2)^{1/2}}{1-\psi\cos\omega}, \quad z = -\frac{R_0\psi\sin\omega}{1-\psi\cos\omega}, \quad \psi = \psi,$$

p136: The equation in the 10th line from the bottom should be

$$\iota_2(r) = \iota_0 + \iota_2(r/a)^2 + \cdots),$$

p237: The 1st line from the top should be
and $j(r) = 0,\ \rho(r) = 0,\ q(r) = q(r)$ for $r > a$. Then $\cdots$

p239: The 10th line from the bottom should be
$\cdots$ is unstable without the wall; that is, $\gamma_c^2(d) < 0$ and $\gamma_c^2(\infty) > 0$.

p251: The 7th line from the bottom should be
$\cdots$ *Fokker-Planck collision term* and $\langle \Delta v\rangle_t, \langle \Delta v_r \Delta v_s\rangle_t$ are

p257: The 17th line from the top should be
This phenomena is called cyclotron damping or cyclotron amplification. Refer to [10.2].

p259: The equation (10.55) should be

$$D(k,\omega_r+\gamma i) = D(k,\omega_r) - \frac{\Pi^2}{k^2} i\pi \frac{1}{n_0} \left.\frac{\partial f_0}{\partial v}\right|_{\omega_r/k}, \qquad (10.55)$$

p354: The equation in the 7th line from the top should be
$\cdots \omega_2 = -(\omega_1 + \omega_3) \cdots$

p369: 'P. N. Yushimanov' in ref.[4.34] should be 'P. N. Yushmanov' (2 places).

p375: 'M. S. Berezhetshij' in ref.[6.7] should be 'M. S. Brezhetshij'.

p379: 'E. E. Yushimanov' in ref.[7.3] should be 'E. E. Yushmanov'.

p390: 'Greenward density, 70' and 'Greenward-Hugill-Murakami parameter, 70' in the right column should be 'Greenwald density, 70' and 'Greenwald-Higill-Murakami parameter, 70' rspectively.