$$
\begin{aligned}
B_r &= -\hat{B}\tanh(\xi) \\
B_\phi &= \sqrt{1-f}\frac{r_n}{r}\frac{B_0}{\cosh(\xi})) \\
B_x &= \epsilon\frac{r_n}{r}\left[\xi\tanh\xi\left(r_n\frac{\hat{B}'(r)}{\hat{B}}+\frac{r_n}{r}\right)-\frac{B_0'(r)}{B_0}\right] \\
B_0 &= \begin{cases} B_c\sqrt{c_0+\left(1-\frac{r-z_0}{r_y-z_0}\right)+\frac{c_1}{1+[(r-r_1)/L_1]^2}} & r\le r_y \\ \\ B_c\sqrt{c_0+\frac{c_1}{1+[(r-r_1)/L_1]^2}} & r>r_y \end{cases} \\
p &= f\frac{B_0^2}{\cosh^2\xi} \\
\xi &= \frac{r\hat{B}x}{\epsilon\, r_n^2} \\
r^2 &= y^2+(z+z_0)^2 \\
\hat{B} &= B_0\sqrt{f+(1-f)\frac{r_n^2}{r^2}} \\
f &= 0.2 \quad \text{and} \quad 0.4 \\
z_0 &= 10 \\
r_n &= 10 \\
r_y &= 40 \\
c_0 &= 0.5 \\
r_1 &= 22 \\
c_1 &= 0.5 \\
L_1 &= 3
\end{aligned}
$$

The Cartesian domain has the following sizes:

$$
\begin{aligned}
n_X &= 100 \quad L_X = [-25.0, 25.0] \\
n_Y &= 160 \quad L_Y = [-40.0, 40.0] \\
n_Z &= 80 \quad L_Z = [0, 40.0]
\end{aligned}
$$

We have set the following boundary conditions:

BC$_X$: rigid walls;

BC$_Y$: rigid walls;

BC$_Z$: open/outflow;