

Target equation:

$$-ia1u^{(1,0)}(x,t) + a2u^{(2,0)}(x,t) - ia3u^{(3,0)}(x,t) + a4u^{(4,0)}(x,t) - bu(x,t)|u(x,t)|^2 + iu^{(0,1)}(x,t) = 0$$

Substitutions:

$$N = 2$$

$$u(x,t) \rightarrow y(z)e^{i(kx-\omega t)}$$

$$z \rightarrow x - C0t$$

$$y(z) \rightarrow AR(z)^2$$

$$R'(z)^2 = R(z)^2 (1 - \chi R(z)^2)$$

Imaginary part of equation after substitutions:

$$y'(z) (a1 - 2a2k - 3a3k^2 + 4a4k^3 - C0) + y^{(3)}(z)(a3 - 4a4k) = 0$$

Real part of equation after substitutions:

$$y(z) (a1k - a2k^2 - a3k^3 + a4k^4 + \omega) + y''(z)(a2 + 3k(a3 - 2a4k)) + a4y^{(4)}(z) - by(z)^3 = 0$$

Constraints on coefficients from imaginary part of equation:

$$a3 \rightarrow 4a4k$$

$$C0 \rightarrow a1 - 2a2k - 8a4k^3$$

Constraints on coefficients from real part of equation:

$$b \rightarrow \frac{120a4\chi^2}{A^2}$$

$$a2 \rightarrow -2(3a4k^2 + 10a4)$$

$$\omega \rightarrow -a1k - 3a4k^4 - 20a4k^2 + 64a4$$