Target equation:

$$-ia_1u^{(1,0)}(x,t)+a_{10}u^{(10,0)}(x,t)-ia_{11}u^{(11,0)}(x,t)+a_{12}u^{(12,0)}(x,t)-ia_{13}u^{(13,0)}(x,t)+a_{14}u^{(14,0)}(x,t)-$$

$$ia_{15}u^{(15,0)}(x,t)+a_{16}u^{(16,0)}(x,t)-ia_{17}u^{(17,0)}(x,t)+a_{18}u^{(18,0)}(x,t)+a_2u^{(2,0)}(x,t)-ia_3u^{(3,0)}(x,t)+$$

$$a_4u^{(4,0)}(x,t)-ia_5u^{(5,0)}(x,t)+a_6u^{(6,0)}(x,t)-ia_7u^{(7,0)}(x,t)+a_8u^{(8,0)}(x,t)-ia_9u^{(9,0)}(x,t)-bu(x,t)\left|u(x,t)\right|^2+$$

$$iu^{(0,1)}(x,t)=0$$

Substitutions:

$$N = 9$$

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

$$z \to x - C0t$$

$$y(z) \to AR(z)^9$$

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

Imaginary part of equation after substitutions:

$$y'(z)\left(a_1 + k\left(k\left(k\left(k\left(k\left(k\left(k\left(k\left(k\left(-10a_{10}k - 11a_{11}k^2 + 12a_{12}k^3 + 13a_{13}k^4 - 14a_{14}k^5 - 15a_{15}k^6 + 16a_{16}k^7 + 1\right.\right.\right.\right.\right.\right.\right.\right.\right.\right.$$

$$y^{(3)}(z)\left(k\left(k\left(k\left(k\left(k\left(k\left(k\left(120a_{10}k + 165a_{11}k^2 - 220a_{12}k^3 - 286a_{13}k^4 + 364a_{14}k^5 + 455a_{15}k^6 - 560a_{16}k^7 - 680\right.\right.\right.\right.\right.\right.\right.\right.$$

$$252a_{10}k^5y^{(5)}(z)+120a_{10}k^3y^{(7)}(z)-10a_{10}ky^{(9)}(z)-462a_{11}k^6y^{(5)}(z)+330a_{11}k^4y^{(7)}(z)-55a_{11}k^2y^{(9)}(z)+$$

$$a_{11}y^{(11)}(z)+792a_{12}k^7y^{(5)}(z)-792a_{12}k^5y^{(7)}(z)+220a_{12}k^3y^{(9)}(z)-12a_{12}ky^{(11)}(z)+1287a_{13}k^8y^{(5)}(z)-$$

$$1716a_{13}k^6y^{(7)}(z)+715a_{13}k^4y^{(9)}(z)-78a_{13}k^2y^{(11)}(z)+a_{13}y^{(13)}(z)-2002a_{14}k^9y^{(5)}(z)+3432a_{14}k^7y^{(7)}(z)-$$

$$2002a_{14}k^5y^{(9)}(z) + 364a_{14}k^3y^{(11)}(z) - 14a_{14}ky^{(13)}(z) - 3003a_{15}k^{10}y^{(5)}(z) + 6435a_{15}k^8y^{(7)}(z) -$$

$$5005a_{15}k^6y^{(9)}(z)+1365a_{15}k^4y^{(11)}(z)-105a_{15}k^2y^{(13)}(z)+a_{15}y^{(15)}(z)+4368a_{16}k^{11}y^{(5)}(z)-11440a_{16}k^9y^{(7)}(z)+$$

$$11440a_{16}k^7y^{(9)}(z) - 4368a_{16}k^5y^{(11)}(z) + 560a_{16}k^3y^{(13)}(z) - 16a_{16}ky^{(15)}(z) + 6188a_{17}k^{12}y^{(5)}(z) -$$

$$19448a_{17}k^{10}y^{(7)}(z)+24310a_{17}k^8y^{(9)}(z)-12376a_{17}k^6y^{(11)}(z)+2380a_{17}k^4y^{(13)}(z)-136a_{17}k^2y^{(15)}(z)+$$

$$a_{17}y^{(17)}(z) - 8568a_{18}k^{13}y^{(5)}(z) + 31824a_{18}k^{11}y^{(7)}(z) - 48620a_{18}k^9y^{(9)}(z) + 31824a_{18}k^7y^{(11)}(z) -$$

$$8568a_{18}k^5y^{(13)}(z) + 816a_{18}k^3y^{(15)}(z) - 18a_{18}ky^{(17)}(z) + a_5y^{(5)}(z) - 6a_6ky^{(5)}(z) - 21a_7k^2y^{(5)}(z) +$$

$$a_7y^{(7)}(z) + 56a_8k^3y^{(5)}(z) - 8a_8ky^{(7)}(z) + 126a_9k^4y^{(5)}(z) - 36a_9k^2y^{(7)}(z) + a_9y^{(9)}(z) = 0$$

Real part of equation after substitutions:

$$-3060a_{18}y^{(4)}(z)k^{14}+2380a_{17}y^{(4)}(z)k^{13}+1820a_{16}y^{(4)}(z)k^{12}+18564a_{18}y^{(6)}(z)k^{12}-1365a_{15}y^{(4)}(z)k^{11}-$$

$$12376a_{17}y^{(6)}(z)k^{11}-1001a_{14}y^{(4)}(z)k^{10}-8008a_{16}y^{(6)}(z)k^{10}-43758a_{18}y^{(8)}(z)k^{10}+715a_{13}y^{(4)}(z)k^9+$$

$$5005a_{15}y^{(6)}(z)k^9 + 24310a_{17}y^{(8)}(z)k^9 + 495a_{12}y^{(4)}(z)k^8 + 3003a_{14}y^{(6)}(z)k^8 + 12870a_{16}y^{(8)}(z)k^8 +$$

$$43758a_{18}y^{(10)}(z)k^8 - 330a_{11}y^{(4)}(z)k^7 - 1716a_{13}y^{(6)}(z)k^7 - 6435a_{15}y^{(8)}(z)k^7 - 19448a_{17}y^{(10)}(z)k^7 -$$

$$210a_{10}y^{(4)}(z)k^6 - 924a_{12}y^{(6)}(z)k^6 - 3003a_{14}y^{(8)}(z)k^6 - 8008a_{16}y^{(10)}(z)k^6 - 18564a_{18}y^{(12)}(z)k^6 +$$

$$126a_9y^{(4)}(z)k^5 + 462a_{11}y^{(6)}(z)k^5 + 1287a_{13}y^{(8)}(z)k^5 + 3003a_{15}y^{(10)}(z)k^5 + 6188a_{17}y^{(12)}(z)k^5 +$$

$$70a_8y^{(4)}(z)k^4+210a_{10}y^{(6)}(z)k^4+495a_{12}y^{(8)}(z)k^4+1001a_{14}y^{(10)}(z)k^4+1820a_{16}y^{(12)}(z)k^4+3060a_{18}y^{(14)}(z)k^4-$$

$$35a_7y^{(4)}(z)k^3-84a_9y^{(6)}(z)k^3-165a_{11}y^{(8)}(z)k^3-286a_{13}y^{(10)}(z)k^3-455a_{15}y^{(12)}(z)k^3-680a_{17}y^{(14)}(z)k^3-$$

$$15a_6y^{(4)}(z)k^2-28a_8y^{(6)}(z)k^2-45a_{10}y^{(8)}(z)k^2-66a_{12}y^{(10)}(z)k^2-91a_{14}y^{(12)}(z)k^2-120a_{16}y^{(14)}(z)k^2-$$

$153a_{18}y^{(16)}(z)k^2 + 5a_5y^{(4)}(z)k + 7a_7y^{(6)}(z)k + 9a_9y^{(8)}(z)k + 11a_{11}y^{(10)}(z)k + 13a_{13}y^{(12)}(z)k +$

$15a_{15}y^{(14)}(z)k+17a_{17}y^{(16)}(z)k-by(z)^3+(-a_{18}k^{18} + a_{17}k^{17} + a_{16}k^{16} - a_{15}k^{15} - a_{14}k^{14} + a_{13}k^{13} + a_{12}k^{12} - a_1$

$(a_2 + k\,(3a_3 + k\,(k\,(k\,(15a_6 + k\,(21a_7 + k\,(k\,(153a_{18}k^9 - 136a_{17}k^8 - 120a_{16}k^7 + 105a_{15}k^6 + 91a_{14}k^5 - 78a_{13}$

$a_4y^{(4)}(z)+a_6y^{(6)}(z)+a_8y^{(8)}(z)+a_{10}y^{(10)}(z)+a_{12}y^{(12)}(z)+a_{14}y^{(14)}(z)+a_{16}y^{(16)}(z)+a_{18}y^{(18)}(z) = 0$

Constraints on coefficients from imaginary part of equation:

$a_{17} \rightarrow 18a_{18}k$

$a_{15} \rightarrow 16a_{16}k + 1632a_{18}k^3$

$a_{13} \rightarrow 14a_{14}k + 1120a_{16}k^3 + 137088a_{18}k^5$

$a_{11} \rightarrow 12a_{12}k + 728a_{14}k^3 + 69888a_{16}k^5 + 8656128a_{18}k^7$

$a_9 \rightarrow 10a_{10}k + 440a_{12}k^3 + 32032a_{14}k^5 + 3111680a_{16}k^7 + 385848320a_{18}k^9$

$a_7 \rightarrow 240a_{10}k^3 + 12672a_{12}k^5 + 933504a_{14}k^7 + 90787840a_{16}k^9 + 11259076608a_{18}k^{11} + 8a_8k$

$a_5 \rightarrow 4032a_{10}k^5 + 215424a_{12}k^7 + 15887872a_{14}k^9 + 1545363456a_{16}k^{11} + 191651217408a_{18}k^{13} +$
$6a_6k + 112a_8k^3$

$a_3 \rightarrow 32640a_{10}k^7+1745920a_{12}k^9+128780288a_{14}k^{11}+12526223360a_{16}k^{13}+1553465966592a_{18}k^{15}+\blacksquare$
$4a_4k + 40a_6k^3 + 896a_8k^5$

$C0 \rightarrow a_1-79360a_{10}k^9-4245504a_{12}k^{11}-313155584a_{14}k^{13}-30460116992a_{16}k^{15}-3777576173568a_{18}k^{17}-\blacksquare$
$2a_2k - 8a_4k^3 - 96a_6k^5 - 2176a_8k^7$

Constraints on coefficients from real part of equation:

$b \rightarrow -\frac{10002268381116211200000a_{18}\chi^9}{A^2}$

$a_{16} \rightarrow -153a_{18}k^2 - 2841a_{18}$

$a_{14} \rightarrow 3060a_{18}k^4 + 340920a_{18}k^2 + 3446052a_{18}$

$a_{12} \rightarrow -18564a_{18}k^6 - 5170620a_{18}k^4 - 313590732a_{18}k^2 - 2335946132a_{18}$

$a_{10} \rightarrow 43758a_{18}k^8 + 22750728a_{18}k^6 + 3449498052a_{18}k^4 + 154172444712a_{18}k^2 + 972321096318a_{18}$

$a_8 \rightarrow -43758a_{18}k^{10}-36563670a_{18}k^8-10348494156a_{18}k^6-1156293335340a_{18}k^4-43754449334310a_{18}k^2-\blacksquare$
$256907539334238a_{18}$

$a_6 \rightarrow 18564a_{18}k^{12}+22750728a_{18}k^{10}+10348494156a_{18}k^8+2158414225968a_{18}k^6+204187430226780a_{18}k^4+\blacksquare$
$7193411101358664a_{18}k^2 + 42942368606859604a_{18}$

$a_4 \rightarrow -3060a_{18}k^{14}-5170620a_{18}k^{12}-3449498052a_{18}k^{10}-1156293335340a_{18}k^8-204187430226780a_{18}k^6-\blacksquare$
$17983527753396660a_{18}k^4 - 644135529102894060a_{18}k^2 - 4362858052479448164a_{18}$

$a_2 \rightarrow 153a_{18}k^{16}+340920a_{18}k^{14}+313590732a_{18}k^{12}+154172444712a_{18}k^{10}+43754449334310a_{18}k^8+$
$7193411101358664a_{18}k^6+644135529102894060a_{18}k^4+26177148314876688984a_{18}k^2+24354706537150319002$

$\omega \rightarrow -a_1k+17a_{18}k^{18}+42615a_{18}k^{16}+44798676a_{18}k^{14}+25695407452a_{18}k^{12}+8750889866862a_{18}k^{10}+\blacksquare$
$1798352775339666a_{18}k^8+214711843034298020a_{18}k^6+13088574157438344492a_{18}k^4+24354706537150319002$
$5669162887825953140625a_{18}$

y(z) - function:

$$\frac{262144a^9 A}{\left(4a^2 e^z + \chi e^{-z}\right)^9}$$

u(x, t) - function:

$$\frac{262144a^9 A e^{i(kx-\omega t)}}{\left(4a^2 e^{C0t+x} + \chi e^{-C0t-x}\right)^9}$$