Target equation:

$$-ia_1u^{(1,0)}(x,t)+a_{10}u^{(10,0)}(x,t)-ia_{11}u^{(11,0)}(x,t)+a_{12}u^{(12,0)}(x,t)-ia_{13}u^{(13,0)}(x,t)+a_{14}u^{(14,0)}(x,t)-$$
$$ia_{15}u^{(15,0)}(x,t)+a_{16}u^{(16,0)}(x,t)-ia_{17}u^{(17,0)}(x,t)+a_{18}u^{(18,0)}(x,t)-ia_{19}u^{(19,0)}(x,t)+a_2u^{(2,0)}(x,t)+$$
$$a_{20}u^{(20,0)}(x,t)-ia_{21}u^{(21,0)}(x,t)+a_{22}u^{(22,0)}(x,t)-ia_{23}u^{(23,0)}(x,t)+a_{24}u^{(24,0)}(x,t)-ia_3u^{(3,0)}(x,t)+$$
$$a_4u^{(4,0)}(x,t)-ia_5u^{(5,0)}(x,t)+a_6u^{(6,0)}(x,t)-ia_7u^{(7,0)}(x,t)+a_8u^{(8,0)}(x,t)-ia_9u^{(9,0)}(x,t)-bu(x,t)\left|u(x,t)\right|^2+$$
$$iu^{(0,1)}(x,t)=0$$

Substitutions:

$$\mathrm{N}=12$$
$$u(x,t)\to y(z)e^{i(kx-\omega t)}$$
$$z\to x-\mathrm{C0}t$$
$$y(z)\to AR(z)^{12}$$
$$R'(z)^2=R(z)^2\left(1-\chi R(z)^2\right)$$

Imaginary part of equation after substitutions:

$$42504a_{24}y^{(5)}(z)k^{19}-33649a_{23}y^{(5)}(z)k^{18}-26334a_{22}y^{(5)}(z)k^{17}-346104a_{24}y^{(7)}(z)k^{17}+20349a_{21}y^{(5)}(z)k^{16}+$$
$$245157a_{23}y^{(7)}(z)k^{16}+15504a_{20}y^{(5)}(z)k^{15}+170544a_{22}y^{(7)}(z)k^{15}+1307504a_{24}y^{(9)}(z)k^{15}-11628a_{19}y^{(5)}(z)k^{14}-$$
$$116280a_{21}y^{(7)}(z)k^{14}-817190a_{23}y^{(9)}(z)k^{14}-8568a_{18}y^{(5)}(z)k^{13}-77520a_{20}y^{(7)}(z)k^{13}-497420a_{22}y^{(9)}(z)k^{13}-$$
$$2496144a_{24}y^{(11)}(z)k^{13}+6188a_{17}y^{(5)}(z)k^{12}+50388a_{19}y^{(7)}(z)k^{12}+293930a_{21}y^{(9)}(z)k^{12}+1352078a_{23}y^{(11)}(z)k^{12}+$$
$$4368a_{16}y^{(5)}(z)k^{11}+31824a_{18}y^{(7)}(z)k^{11}+167960a_{20}y^{(9)}(z)k^{11}+705432a_{22}y^{(11)}(z)k^{11}+2496144a_{24}y^{(13)}(z)k^{11}-$$
$$3003a_{15}y^{(5)}(z)k^{10}-19448a_{17}y^{(7)}(z)k^{10}-92378a_{19}y^{(9)}(z)k^{10}-352716a_{21}y^{(11)}(z)k^{10}-1144066a_{23}y^{(13)}(z)k^{10}-$$
$$2002a_{14}y^{(5)}(z)k^9-11440a_{16}y^{(7)}(z)k^9-48620a_{18}y^{(9)}(z)k^9-167960a_{20}y^{(11)}(z)k^9-497420a_{22}y^{(13)}(z)k^9-$$
$$1307504a_{24}y^{(15)}(z)k^9+1287a_{13}y^{(5)}(z)k^8+6435a_{15}y^{(7)}(z)k^8+24310a_{17}y^{(9)}(z)k^8+75582a_{19}y^{(11)}(z)k^8+$$
$$203490a_{21}y^{(13)}(z)k^8+490314a_{23}y^{(15)}(z)k^8+792a_{12}y^{(5)}(z)k^7+3432a_{14}y^{(7)}(z)k^7+11440a_{16}y^{(9)}(z)k^7+$$
$$31824a_{18}y^{(11)}(z)k^7+77520a_{20}y^{(13)}(z)k^7+170544a_{22}y^{(15)}(z)k^7+346104a_{24}y^{(17)}(z)k^7-462a_{11}y^{(5)}(z)k^6-$$
$$1716a_{13}y^{(7)}(z)k^6-5005a_{15}y^{(9)}(z)k^6-12376a_{17}y^{(11)}(z)k^6-27132a_{19}y^{(13)}(z)k^6-54264a_{21}y^{(15)}(z)k^6-$$
$$100947a_{23}y^{(17)}(z)k^6-252a_{10}y^{(5)}(z)k^5-792a_{12}y^{(7)}(z)k^5-2002a_{14}y^{(9)}(z)k^5-4368a_{16}y^{(11)}(z)k^5-$$
$$8568a_{18}y^{(13)}(z)k^5-15504a_{20}y^{(15)}(z)k^5-26334a_{22}y^{(17)}(z)k^5-42504a_{24}y^{(19)}(z)k^5+126a_9y^{(5)}(z)k^4+$$
$$330a_{11}y^{(7)}(z)k^4+715a_{13}y^{(9)}(z)k^4+1365a_{15}y^{(11)}(z)k^4+2380a_{17}y^{(13)}(z)k^4+3876a_{19}y^{(15)}(z)k^4+$$
$$5985a_{21}y^{(17)}(z)k^4+8855a_{23}y^{(19)}(z)k^4+56a_8y^{(5)}(z)k^3+120a_{10}y^{(7)}(z)k^3+220a_{12}y^{(9)}(z)k^3+364a_{14}y^{(11)}(z)k^3+$$
$$560a_{16}y^{(13)}(z)k^3+816a_{18}y^{(15)}(z)k^3+1140a_{20}y^{(17)}(z)k^3+1540a_{22}y^{(19)}(z)k^3+2024a_{24}y^{(21)}(z)k^3-$$
$$21a_7y^{(5)}(z)k^2-36a_9y^{(7)}(z)k^2-55a_{11}y^{(9)}(z)k^2-78a_{13}y^{(11)}(z)k^2-105a_{15}y^{(13)}(z)k^2-136a_{17}y^{(15)}(z)k^2-$$
$$171a_{19}y^{(17)}(z)k^2-210a_{21}y^{(19)}(z)k^2-253a_{23}y^{(21)}(z)k^2-6a_6y^{(5)}(z)k-8a_8y^{(7)}(z)k-10a_{10}y^{(9)}(z)k-$$
$$12a_{12}y^{(11)}(z)k-14a_{14}y^{(13)}(z)k-16a_{16}y^{(15)}(z)k-18a_{18}y^{(17)}(z)k-20a_{20}y^{(19)}(z)k-22a_{22}y^{(21)}(z)k-$$
$$24a_{24}y^{(23)}(z)k+(a_1-\mathrm{C0}+k\,(k\,(k\,(4a_4+k\,(5a_5+k\,(k\,(k\,(8a_8+k\,(9a_9+k\,(k\,(k\,(12a_{12}+k\,(13a_{13}+k\,(k\,(24$$
$$(a_3+k\,(k\,(k\,(20a_6+k\,(35a_7+k\,(k\,(k\,(120a_{10}+k\,(165a_{11}+k\,(k\,(k\,(364a_{14}+k\,(-2024a_{24}k^9+1771a_{23}k^8+$$

$a_5y^{(5)}(z)+a_7y^{(7)}(z)+a_9y^{(9)}(z)+a_{11}y^{(11)}(z)+a_{13}y^{(13)}(z)+a_{15}y^{(15)}(z)+a_{17}y^{(17)}(z)+a_{19}y^{(19)}(z)+$
$a_{21}y^{(21)}(z)+a_{23}y^{(23)}(z)=0$

Real part of equation after substitutions:

$10626a_{24}y^{(4)}(z)k^{20}-8855a_{23}y^{(4)}(z)k^{19}-7315a_{22}y^{(4)}(z)k^{18}-134596a_{24}y^{(6)}(z)k^{18}+5985a_{21}y^{(4)}(z)k^{17}+$
$100947a_{23}y^{(6)}(z)k^{17}+4845a_{20}y^{(4)}(z)k^{16}+74613a_{22}y^{(6)}(z)k^{16}+735471a_{24}y^{(8)}(z)k^{16}-3876a_{19}y^{(4)}(z)k^{15}-$
$54264a_{21}y^{(6)}(z)k^{15}-490314a_{23}y^{(8)}(z)k^{15}-3060a_{18}y^{(4)}(z)k^{14}-38760a_{20}y^{(6)}(z)k^{14}-319770a_{22}y^{(8)}(z)k^{14}-$
$1961256a_{24}y^{(10)}(z)k^{14}+2380a_{17}y^{(4)}(z)k^{13}+27132a_{19}y^{(6)}(z)k^{13}+203490a_{21}y^{(8)}(z)k^{13}+1144066a_{23}y^{(10)}(z)k^{13}+$
$1820a_{16}y^{(4)}(z)k^{12}+18564a_{18}y^{(6)}(z)k^{12}+125970a_{20}y^{(8)}(z)k^{12}+646646a_{22}y^{(10)}(z)k^{12}+2704156a_{24}y^{(12)}(z)k^{12}-$
$1365a_{15}y^{(4)}(z)k^{11}-12376a_{17}y^{(6)}(z)k^{11}-75582a_{19}y^{(8)}(z)k^{11}-352716a_{21}y^{(10)}(z)k^{11}-1352078a_{23}y^{(12)}(z)k^{11}-$
$1001a_{14}y^{(4)}(z)k^{10}-8008a_{16}y^{(6)}(z)k^{10}-43758a_{18}y^{(8)}(z)k^{10}-184756a_{20}y^{(10)}(z)k^{10}-646646a_{22}y^{(12)}(z)k^{10}-$
$1961256a_{24}y^{(14)}(z)k^{10}+715a_{13}y^{(4)}(z)k^9+5005a_{15}y^{(6)}(z)k^9+24310a_{17}y^{(8)}(z)k^9+92378a_{19}y^{(10)}(z)k^9+$
$293930a_{21}y^{(12)}(z)k^9+817190a_{23}y^{(14)}(z)k^9+495a_{12}y^{(4)}(z)k^8+3003a_{14}y^{(6)}(z)k^8+12870a_{16}y^{(8)}(z)k^8+$
$43758a_{18}y^{(10)}(z)k^8+125970a_{20}y^{(12)}(z)k^8+319770a_{22}y^{(14)}(z)k^8+735471a_{24}y^{(16)}(z)k^8-330a_{11}y^{(4)}(z)k^7-$
$1716a_{13}y^{(6)}(z)k^7-6435a_{15}y^{(8)}(z)k^7-19448a_{17}y^{(10)}(z)k^7-50388a_{19}y^{(12)}(z)k^7-116280a_{21}y^{(14)}(z)k^7-$
$245157a_{23}y^{(16)}(z)k^7-210a_{10}y^{(4)}(z)k^6-924a_{12}y^{(6)}(z)k^6-3003a_{14}y^{(8)}(z)k^6-8008a_{16}y^{(10)}(z)k^6-$
$18564a_{18}y^{(12)}(z)k^6-38760a_{20}y^{(14)}(z)k^6-74613a_{22}y^{(16)}(z)k^6-134596a_{24}y^{(18)}(z)k^6+126a_9y^{(4)}(z)k^5+$
$462a_{11}y^{(6)}(z)k^5+1287a_{13}y^{(8)}(z)k^5+3003a_{15}y^{(10)}(z)k^5+6188a_{17}y^{(12)}(z)k^5+11628a_{19}y^{(14)}(z)k^5+$
$20349a_{21}y^{(16)}(z)k^5+33649a_{23}y^{(18)}(z)k^5+70a_8y^{(4)}(z)k^4+210a_{10}y^{(6)}(z)k^4+495a_{12}y^{(8)}(z)k^4+$
$1001a_{14}y^{(10)}(z)k^4+1820a_{16}y^{(12)}(z)k^4+3060a_{18}y^{(14)}(z)k^4+4845a_{20}y^{(16)}(z)k^4+7315a_{22}y^{(18)}(z)k^4+$
$10626a_{24}y^{(20)}(z)k^4-35a_7y^{(4)}(z)k^3-84a_9y^{(6)}(z)k^3-165a_{11}y^{(8)}(z)k^3-286a_{13}y^{(10)}(z)k^3-455a_{15}y^{(12)}(z)k^3-$
$680a_{17}y^{(14)}(z)k^3-969a_{19}y^{(16)}(z)k^3-1330a_{21}y^{(18)}(z)k^3-1771a_{23}y^{(20)}(z)k^3-15a_6y^{(4)}(z)k^2-$
$28a_8y^{(6)}(z)k^2-45a_{10}y^{(8)}(z)k^2-66a_{12}y^{(10)}(z)k^2-91a_{14}y^{(12)}(z)k^2-120a_{16}y^{(14)}(z)k^2-153a_{18}y^{(16)}(z)k^2-$
$190a_{20}y^{(18)}(z)k^2-231a_{22}y^{(20)}(z)k^2-276a_{24}y^{(22)}(z)k^2+5a_5y^{(4)}(z)k+7a_7y^{(6)}(z)k+9a_9y^{(8)}(z)k+$
$11a_{11}y^{(10)}(z)k+13a_{13}y^{(12)}(z)k+15a_{15}y^{(14)}(z)k+17a_{17}y^{(16)}(z)k+19a_{19}y^{(18)}(z)k+21a_{21}y^{(20)}(z)k+$
$23a_{23}y^{(22)}(z)k-by(z)^3+(a_{24}k^{24}-a_{23}k^{23}-a_{22}k^{22}+a_{21}k^{21}+a_{20}k^{20}-a_{19}k^{19}-a_{18}k^{18}+a_{17}k^{17}+a_{16}k^{16}-a_1$
$(a_2+k\,(3a_3+k\,(k\,(15a_6+k\,(21a_7+k\,(k\,(45a_{10}+k\,(55a_{11}+k\,(k\,(91a_{14}+k\,(-276a_{24}k^9+253a_{23}k^8$
$a_4y^{(4)}(z)+a_6y^{(6)}(z)+a_8y^{(8)}(z)+a_{10}y^{(10)}(z)+a_{12}y^{(12)}(z)+a_{14}y^{(14)}(z)+a_{16}y^{(16)}(z)+a_{18}y^{(18)}(z)+$
$a_{20}y^{(20)}(z)+a_{22}y^{(22)}(z)+a_{24}y^{(24)}(z)=0$

Constraints on coefficients from imaginary part of equation:

$a_{23}\to 24a_{24}k$

$a_{21}\to 22a_{22}k+4048a_{24}k^3$

$a_{19}\to 20a_{20}k+3080a_{22}k^3+680064a_{24}k^5$

$a_{17}\to 18a_{18}k+2280a_{20}k^3+421344a_{22}k^5+94140288a_{24}k^7$

$a_{15}\to 16a_{16}k+1632a_{18}k^3+248064a_{20}k^5+46387968a_{22}k^7+10376351744a_{24}k^9$

$a_{13} \to 14a_{14}k+1120a_{16}k^3+137088a_{18}k^5+21085440a_{20}k^7+3947525120a_{22}k^9+883115778048a_{24}k^{11}$

$a_{11} \to 12a_{12}k+728a_{14}k^3+69888a_{16}k^5+8656128a_{18}k^7+1332930560a_{20}k^9+249576198144a_{22}k^{11}+55834388004864a_{24}k^{13}$

$a_9 \to 10a_{10}k+440a_{12}k^3+32032a_{14}k^5+3111680a_{16}k^7+385848320a_{18}k^9+59422904320a_{20}k^{11}+11126417899520a_{22}k^{13}+2489170300469248a_{24}k^{15}$

$a_7 \to 240a_{10}k^3+12672a_{12}k^5+933504a_{14}k^7+90787840a_{16}k^9+11259076608a_{18}k^{11}+1733987205120a_{20}k^{13}+324674387017728a_{22}k^{15}+72635234665365504a_{24}k^{17}+8a_8k$

$a_5 \to 4032a_{10}k^5+215424a_{12}k^7+15887872a_{14}k^9+1545363456a_{16}k^{11}+191651217408a_{18}k^{13}+29515853365248a_{20}k^{15}+5526593941929984a_{22}k^{17}+1236393972835811328a_{24}k^{19}+6a_6k+112a_8k^3$

$a_3 \to 32640a_{10}k^7+1745920a_{12}k^9+128780288a_{14}k^{11}+12526223360a_{16}k^{13}+1553465966592a_{18}k^{15}+239246490992640a_{20}k^{17}+44796883073761280a_{22}k^{19}+10021832059523170304a_{24}k^{21}+4a_4k+40a_6k^3+896a_8k^5$

$\mathrm{C0} \to a_1-79360a_{10}k^9-4245504a_{12}k^{11}-313155584a_{14}k^{13}-30460116992a_{16}k^{15}-3777576173568a_{18}k^{17}-2a_2k-581777702256640a_{20}k^{19}-108932957168730112a_{22}k^{21}-2437017327616445644 8a_{24}k^{23}-8a_4k^3-96a_6k^5-2176a_8k^7$

Constraints on coefficients from real part of equation:

$b \to \frac{25886714281671238500247142400000 0a_{24}\chi^{12}}{A^2}$

$a_{22} \to -276a_{24}k^2-6920a_{24}$

$a_{20} \to 10626a_{24}k^4+1598520a_{24}k^2+21332080a_{24}$

$a_{18} \to -134596a_{24}k^6-50619800a_{24}k^4-4053095200a_{24}k^2-38682744320a_{24}$

$a_{16} \to 735471a_{24}k^8+516321960a_{24}k^6+103353927600a_{24}k^4+5918459880960a_{24}k^2+45889768165120a_{24}$

$a_{14} \to -1961256a_{24}k^{10}-2212808400a_{24}k^8-826831420800a_{24}k^6-118369197619200a_{24}k^4-5506772179814400a_{24}k^2-37462825494456320a_{24}$

$a_{12} \to 2704156a_{24}k^{12}+4474790320a_{24}k^{10}+2687202117600a_{24}k^8+718106465556480a_{24}k^6+83519378060518400a_{24}k^4+34091171199955251 20a_{24}k^2+21546002383306854400a_{24}$

$a_{10} \to -1961256a_{24}k^{14}-4474790320a_{24}k^{12}-3941229772480a_{24}k^{10}-1692679525954560a_{24}k^8-367485263466280960a_{24}k^6-37500288319950776320a_{24}k^4-14220361572985 23390400a_{24}k^2-87815133500866$

$a_8 \to 735471a_{24}k^{16}+2212808400a_{24}k^{14}+2687202117600a_{24}k^{12}+1692679525954560a_{24}k^{10}+590601316285094400a_{24}k^8+1125008649598523289 60a_{24}k^6+10665271179736892928000a_{24}k^4+3951681007538998001664 00a_{24}k^2+25129039002292789077606 40a_{24}$

$a_6 \to -134596a_{24}k^{18}-516321960a_{24}k^{16}-826831420800a_{24}k^{14}-718106465556480a_{24}k^{12}-367485263466280960a_{24}k^{10}-1125008649598523289 60a_{24}k^8-19908506202175533465600a_{24}k^6-184411780351819906744320 0a_{24}k^4-70361309206419809417297920a_{24}k^2-491495535786667276574392320a_2$

$a_4 \to 10626a_{24}k^{20}+50619800a_{24}k^{18}+103353927600a_{24}k^{16}+118369197619200a_{24}k^{14}+83519378060518400a_{24}$

$$375002883199507763 20a_{24}k^{10}+106652711797368929280 00a_{24}k^{8}+184411780351819906744320 0a_{24}k^{6}+$$
$$175903273016049523543244800a_{24}k^{4}+737243303680000914861588480 0a_{24}k^{2}+622546200965899037395742 8$$
$$a_2 \to -276a_{24}k^{22}-1598520a_{24}k^{20}-4053095200a_{24}k^{18}-5918459880960a_{24}k^{16}-5506772179814400a_{24}k^{14}-$$
$$340911711999552512 0a_{24}k^{12}-142203615729825239040 0a_{24}k^{10}-395168100753899800166400a_{24}k^{8}-$$
$$703613092064198094172979 20a_{24}k^{6}-737243303680000914861588480 0a_{24}k^{4}-373527720579539422437445 73$$
$$457657682930378421951182929920 0a_{24}$$
$$\omega \to -a_1k-23a_{24}k^{24}-145320a_{24}k^{22}-405309520a_{24}k^{20}-657606653440a_{24}k^{18}-688346522476800a_{24}k^{16}-$$
$$487016731427932160a_{24}k^{14}-237006026216375398400a_{24}k^{12}-790336201507799600332 80a_{24}k^{10}-$$
$$175903273016049523543244 80a_{24}k^{8}-245747767893333638287196 1600a_{24}k^{6}-186763860289769711218722 86$$
$$457657682930378421951182929920 0a_{24}k^{2} + 147398965045111810582370058240000a_{24}$$

y(z) - function:

$$\frac{16777216a^{12}A}{(4a^2e^{z}+\chi e^{-z})^{12}}$$

u(x, t) - function:

$$\frac{16777216a^{12}Ae^{i(kx-\omega t)}}{(4a^2e^{\mathrm{C0}t+x}+\chi e^{-\mathrm{C0}t-x})^{12}}$$