03. Sep. 2006

Numerical results for counter-gravitation

The equation

(1)
$$\frac{d^2\phi}{dr^2} + \left(\frac{1}{r} - \omega_{r,int}\right)\frac{d\phi}{dr} - \left(\frac{1}{r^2} + \frac{\omega_{r,int}}{r}\right)\phi = -\frac{\rho}{\varepsilon_0}$$

has been solved numerically. This is the radial equation of the resonant Coulomb law of paper63 (eq.34), enhanced by an additional spin connection term which describes the interaction of gravitation and electromagnetism. In order to study the solutions of this equation, we first consider the interaction-free case, $\omega_{r,int} = 0$, with no driving charge density ρ. Equation (1) contains a singularity for r=0. Therefore we integrate numerically from right to left. There are three types of solutions, depending on the initial conditions on the right-hand side. Starting at r=10, we have chosen the three combinations

(2a-c) $\Phi(r=10) = 0.11$, $d\Phi/dr\ (r=10) = 0.01$

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$\Phi(r=10) = 0.09$, $d\Phi/dr\ (r=10) = 0.01$

In Fig. 1 the three solutions are graphed. In the second case, the initial conditions define a straight line which goes through the coordinate origin. If the direction of this line does not point to the center, the solution Φ(r) turns to plus or minus inifinity for $r\rightarrow 0$.

In the following we choose the initial conditions in such a way that the ordinary Coulomb solution for a charge at r=0 is obtained. Then the solution (setting $4\pi\varepsilon_0$ to unity) is

(3a-b) $\Phi(r) = -1/r$,

$d\Phi/dr = 1/r^2$.

For r=10 we obtain $\Phi(10) = -0.1$ and $d\Phi/dr = 0.01$. Now we switch on the interacting spin connection. The form of it is unknown, we only know that it is a function of r and possibly a fuctional of Φ. In the limit $r\rightarrow\infty$ it should vanish. We assume it to have the same form as for the resonant Coulomb law: $\omega_{r,int} = \pm 1/r$. Then we have for the three values in vector boson notation (see paper 66):

(4a-c) $\omega_{r,int\,[-1]} = -1/r$,

$\omega_{r,int\,[0]} = 0$,

$\omega_{r,int\,[+1]} = 1/r$.

Inserting this form into Eq. (1) with no stimulation of resonance (ρ=0) leads in all cases (4a-c) to nearly the same solutions. Differences are not visible in the graph (Fig. 2). This is in accordance with our finding in paper 61 (Table 1) where the Coulomb spin connection did not lead to any remarkable deviations from the ordinary Coulomb law.

The situation changes if we apply a driving term ρ which is dependent on a predefined wave number κ. In the simple case

(5) $\rho = A\cos(\kappa r)$

(depicted in Fig. 4a) we get a clear dependence of Φ from the wave number. Even the characteristic of the solution changes as can be seen from Fig. 3a. In this diagram Φ was plotted for four κ values (0.25, 0.5, 1., 2.) and the interacting spin connection (Equ. 4a). Another interesting question is how the three spin connections lead to different solutions Φ if the wave number is the same. This is result presented in Figs. 3b and c. Obviously the characteristic remains the same, but the $\omega_{r,int\,[-1]}$ leads to larger values of $|\Phi|$ while $\omega_{r,int\,[+1]}$ effects a reduction.

The most interesting question is how the driving force in combination with the interacting spin connection leads to resonances of Φ. In contrast to the results described in papers 61 and 63, an oscillatory ρ does not lead to oscillatory resonances in Φ. The main effect is the enhancement of the rate of increase or decrease for $r \to 0$. The effect is concentrated to the center of the charge, which is plausible since gravity comes from the central mass and interaction with electromagnetism is highest where both have their strongest values.

type	equation
1	$f_1(r) = A\cos(\kappa r)$
2	$f_2(r) = A\cos(\kappa r)\exp(-0.25\cdot r)$
3	$f_3(r) = A\left(\sin(\kappa r) + \sin(\kappa\cdot 2r)\right)^2$
4	$f_4(r) = A\cos(2\kappa r)\cos(\cos(\kappa r))\cdot\cosh(\sin(\kappa r)) + \sin(2\kappa r)\sin(\cos(\kappa r))\cdot\sinh(\sin(\kappa r))$
5	$f_5(r) = \begin{cases} 0.5A & \text{if } f_4(r) > -0.2A \\ -1.5A & \text{elsewhere} \end{cases}$

Table 1. Models for the driving force

Before looking at the results in detail we list the models for the driving force used (Table 1). The first type is a pure cosine term which is folded by an exponentially decreasing function in the second. Type 3 is a combination of two frequencies while type 4 is the driving force obtained for the equivalent circuit in paper 63 (essentially a combination of three frequencies). Finally we have made this model to a rectangular signal in type 5. The signal forms are shown in Figs. 4a-e.

The resonance curves show some maximal amplitude of Φ in dependence of κ. Since we do not have an oscillatory maximum difference as in papers 61 and 63, we have chosen the value of Φ at the first radial grid point next to r=0 as an indication of the resonance. This value is plottet against κ in Figs. 5a-e. The five diagrams correspond to the driving forces of Fig. 4. Resonance is not sharply structured but more oscillatory in nature. Figs. 5a and b show a harmonic form with maximum at κ=0. This means that a constant ρ produces the highest resonance. Other wave forms (Figs. 5c, d) lead to anharmonic resonance curves. It is remarkable that the driving force of the Coulomb resonant circuit (paper 63) produces also a very high effect (compare the ordinate values of the diagrams). This may be a hint that both the Coulomb and gravito-electromagnetic interactional resonance are connected.

The last example (Fig. 5e) of this group shows the result of a rectangular signal (Fig. 4e). The signal amplitudes have been adjusted to Fig. 4d. The rectangular form obviously enhances the first maximum at κ=0.2. According to the examples considered here, this is the most effective form of the driving force to evoke resonance effects. For an exact comparison the driving forces would have to be normalized precisely, which was not the case in this calculation.

Finally we have changed the spin connection form of Eq. (4) from $1/r$ to $1/r^3$ type. This gives significantly larger differences in the resonance diagram up to a value of 35,000. The effects of the vector boson [0] and [1] are nearly identical on this scale, the boson [-1] produces a giant resonance. This last example shows that the form of the spin connection resonance may be more important than the exact form of the driving force.

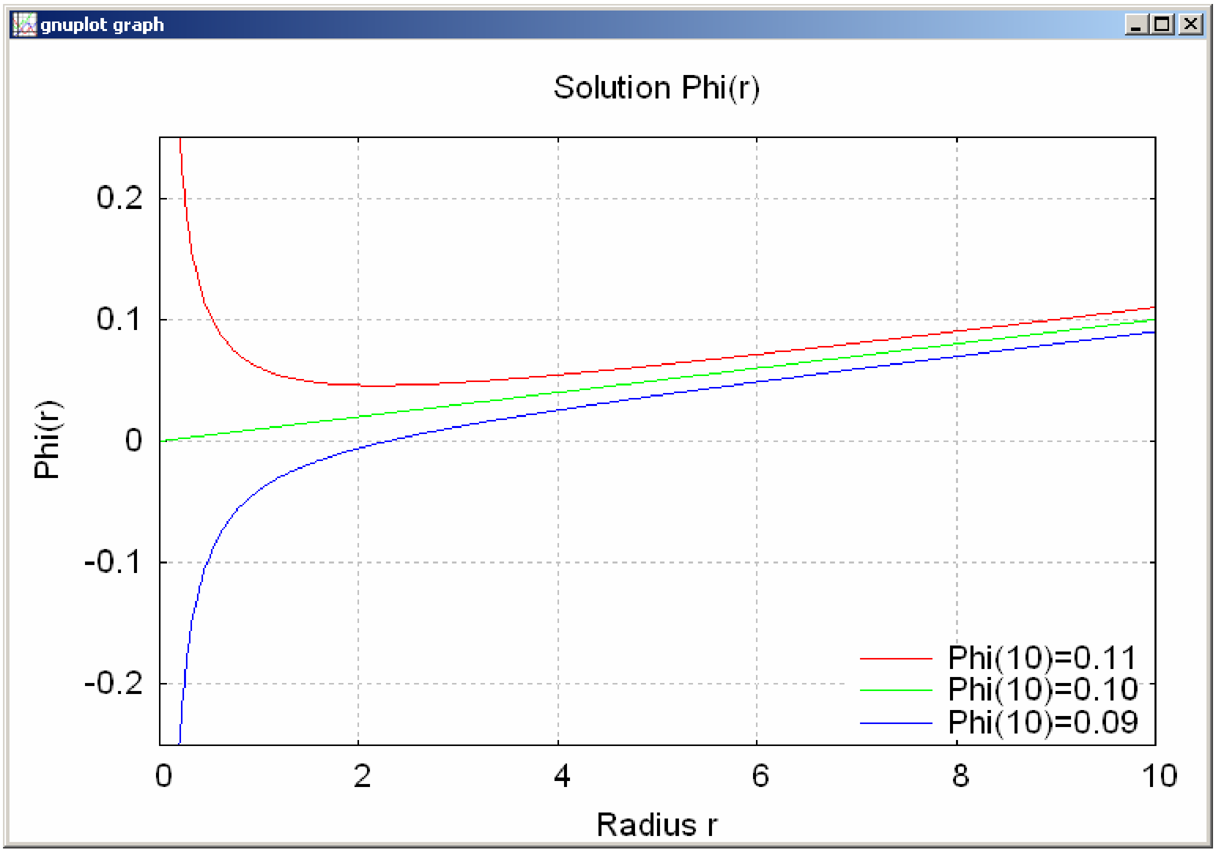

Fig. 1. Solution types for Eq. (1) for $\omega_{r,int} = 0$, no driving force, dependent on inital conditions at the right ($d\Phi/dr(10) = 0.01$)

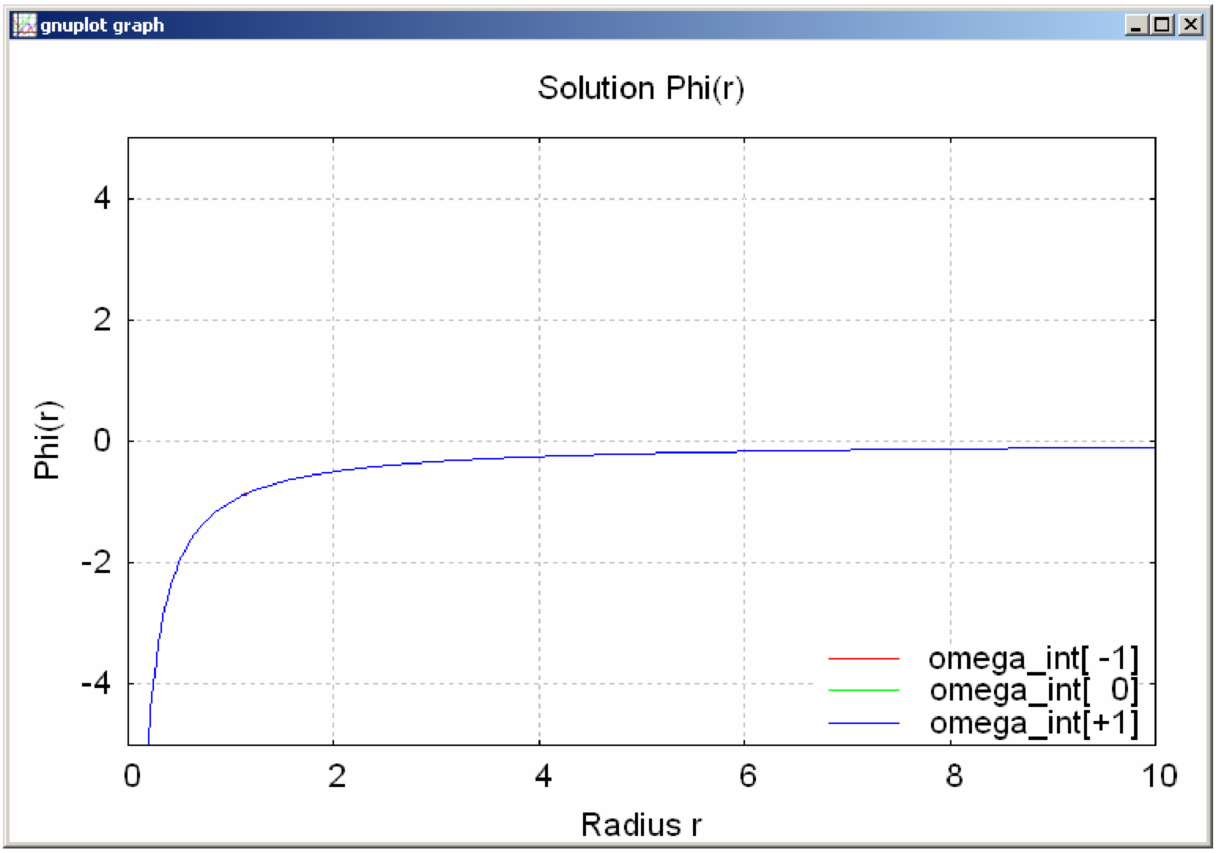

Fig. 2. Solution for $\omega_{r,int} = \omega_{r,Coul}$, no driving force

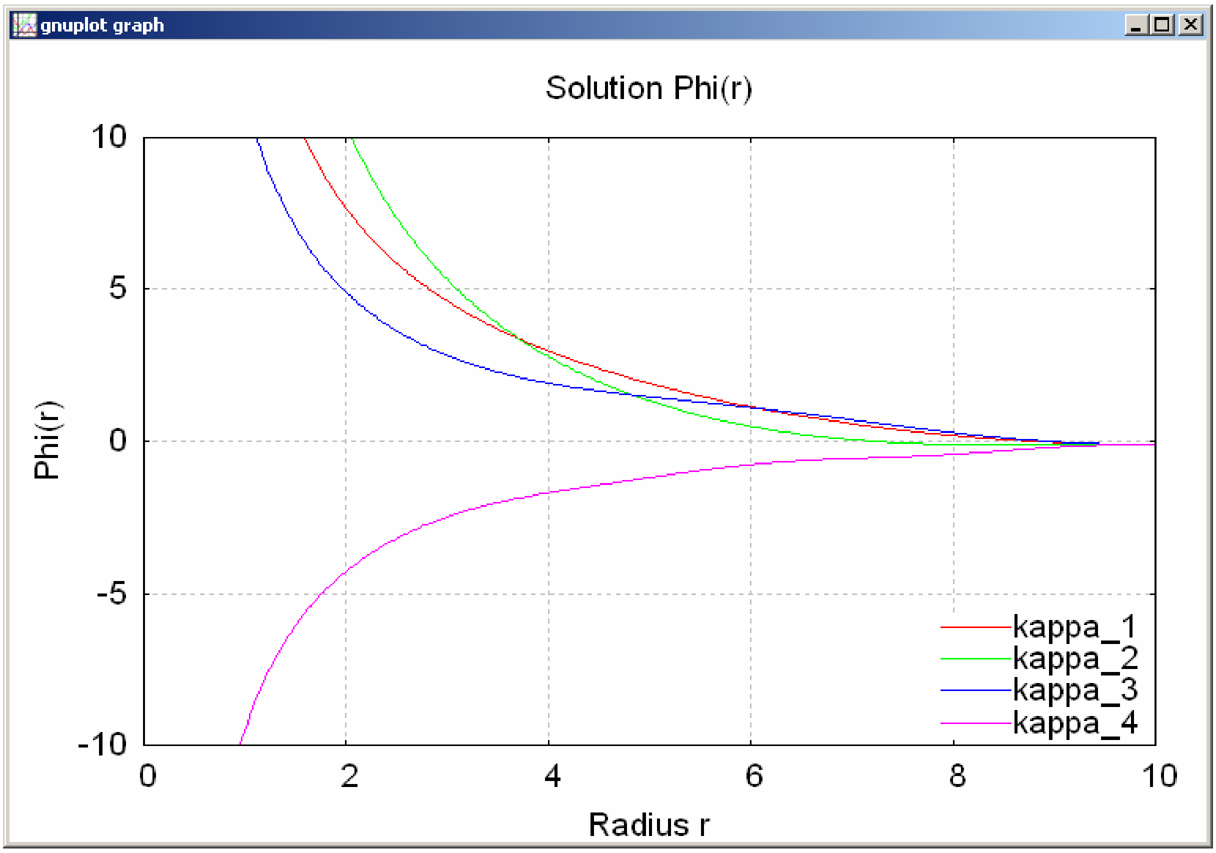

Fig. 3a. κ-dependence of Φ for type=1, $\omega_{r,int\,[-1]}$, κ =.25, .5, 1., 2.

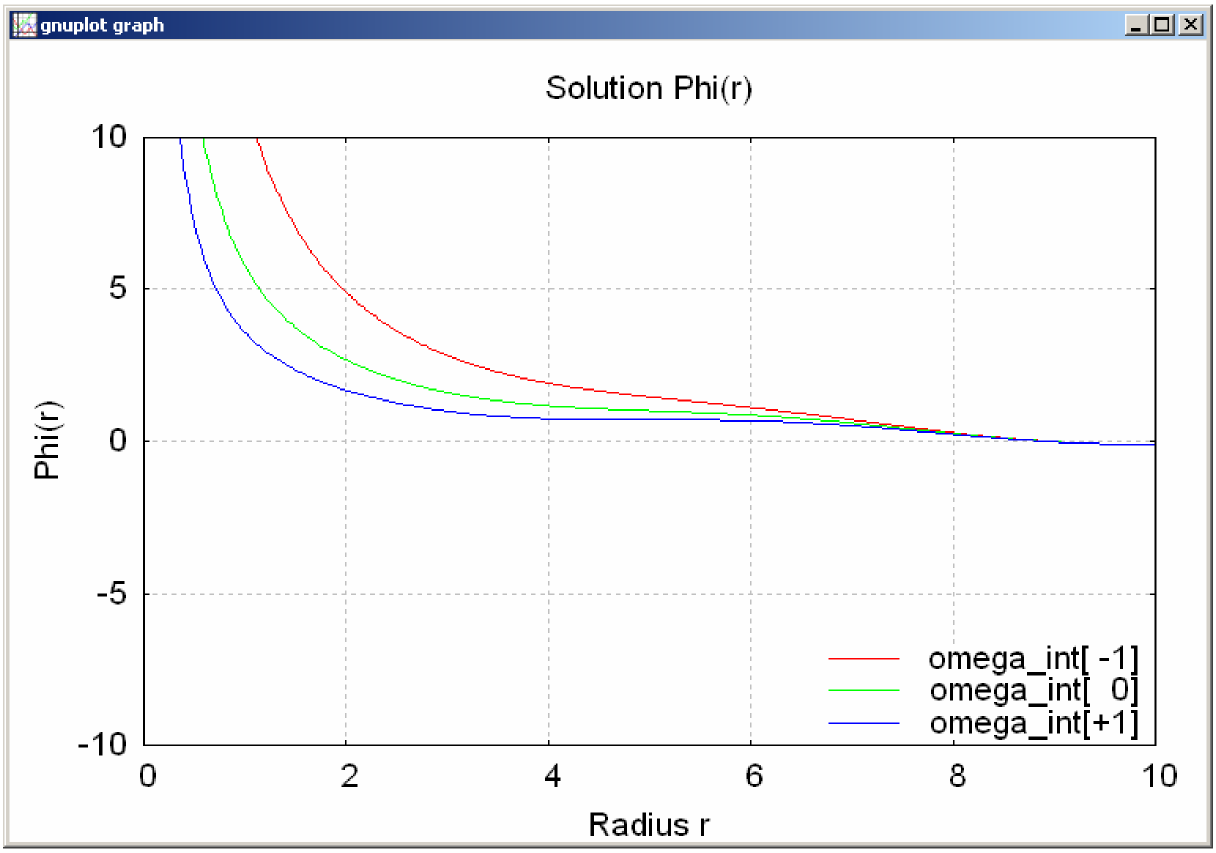

Fig. 3b. $\omega_{r,int}$-dependence for κ=1.

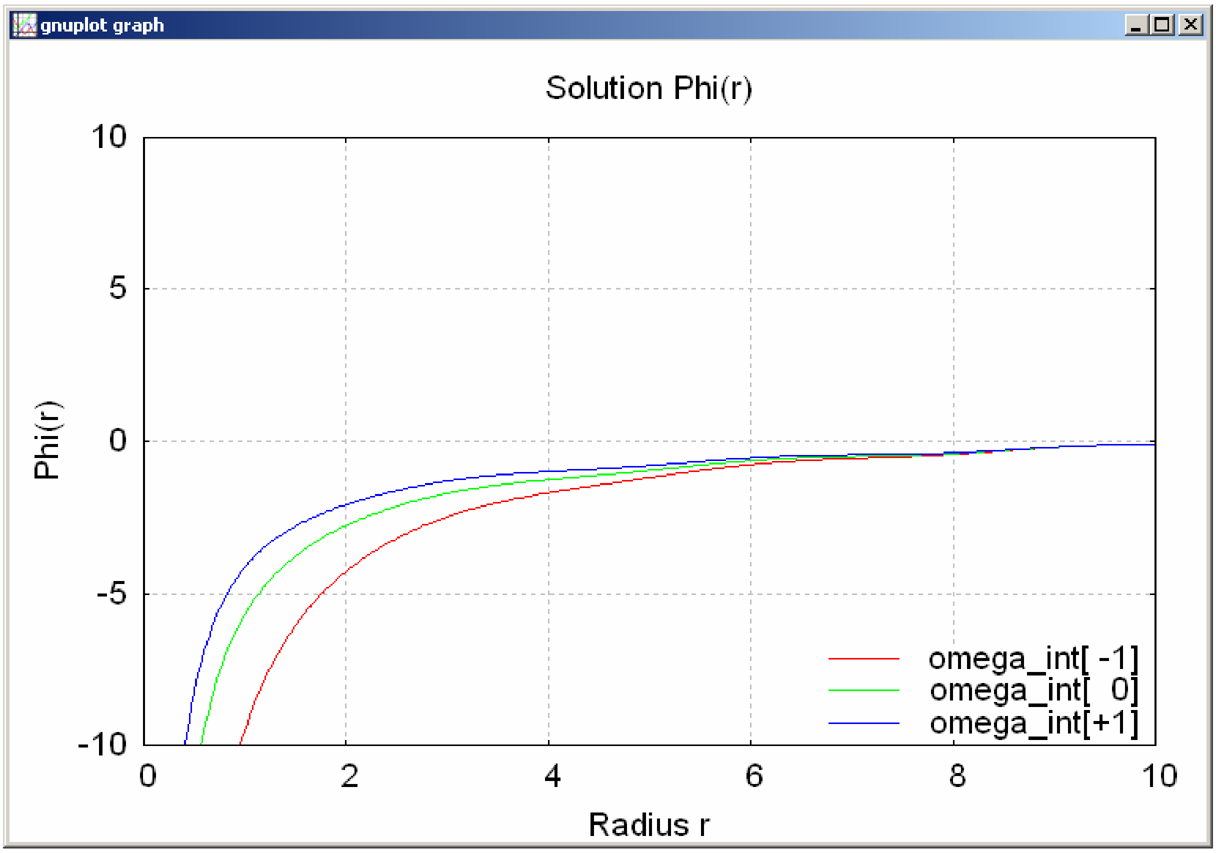

Fig. 3c. $\omega_{r,int}$-dependence for κ=2.

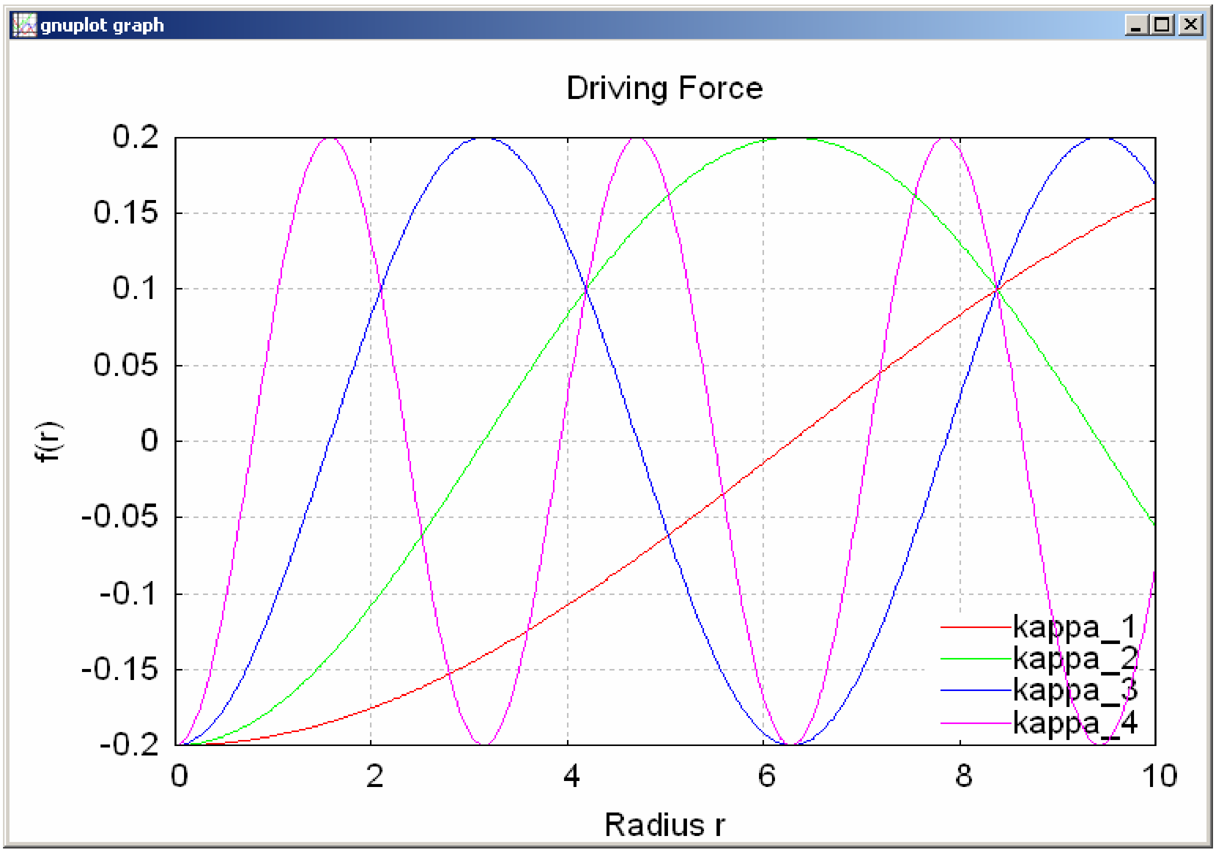

Fig. 4a. Driving force, type1, for four κ values: κ = 0.25, 0.5, 1., 2.

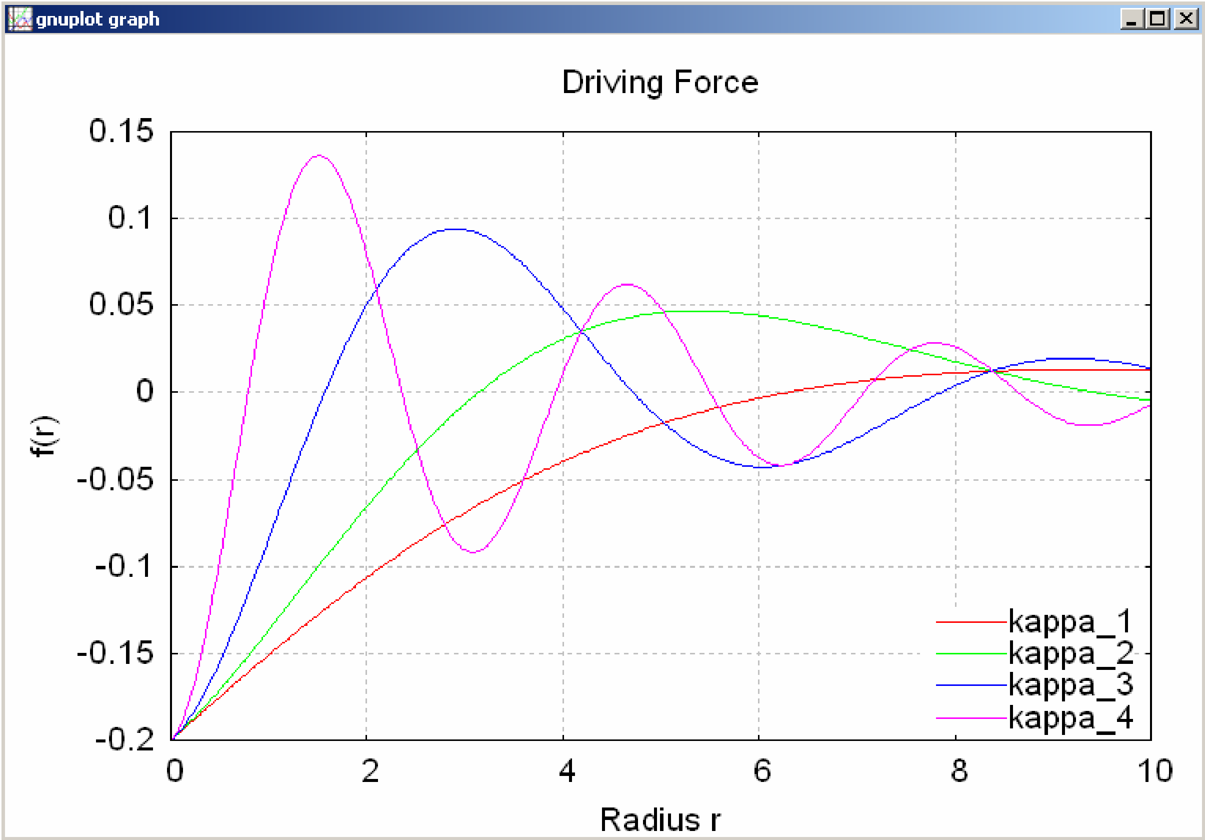

Fig. 4b. Driving force, type 2, for four κ values κ = 0.25, 0.5, 1., 2.

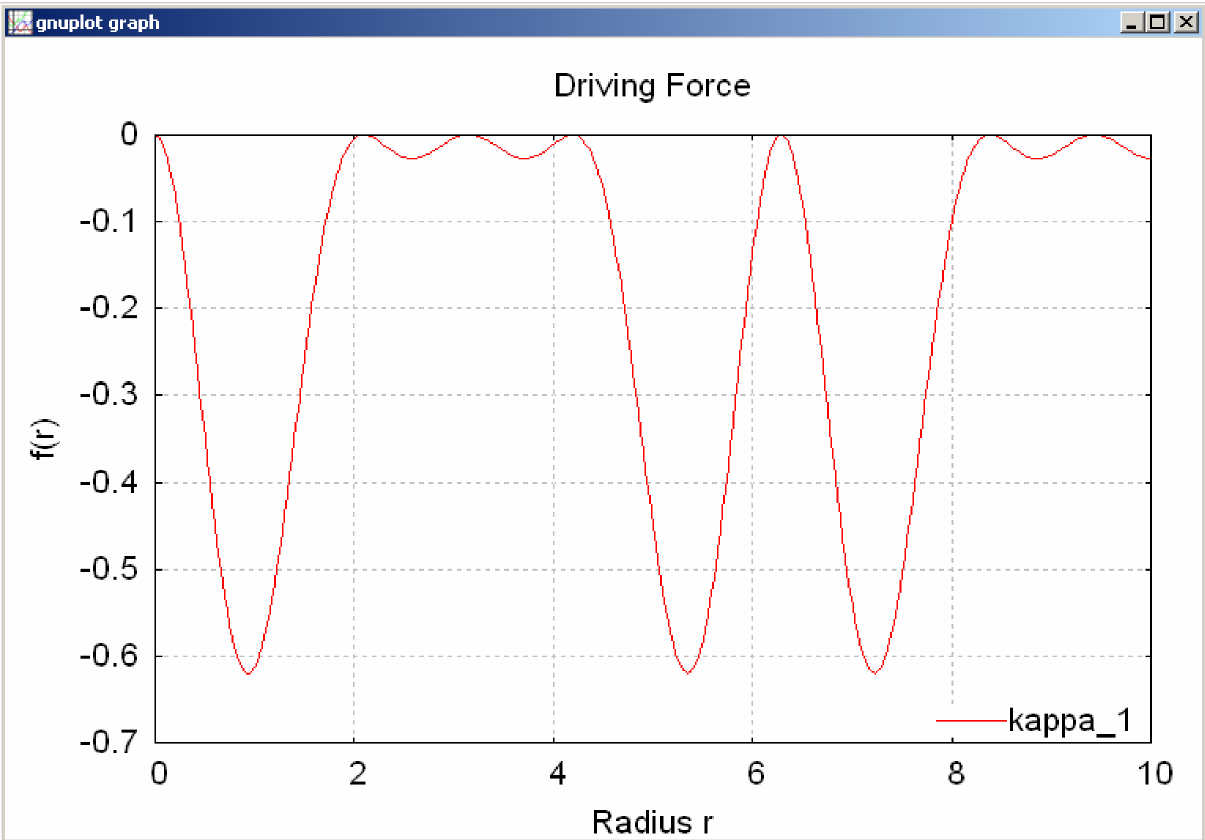

Fig. 4c. Driving force, type 3, κ = 1.

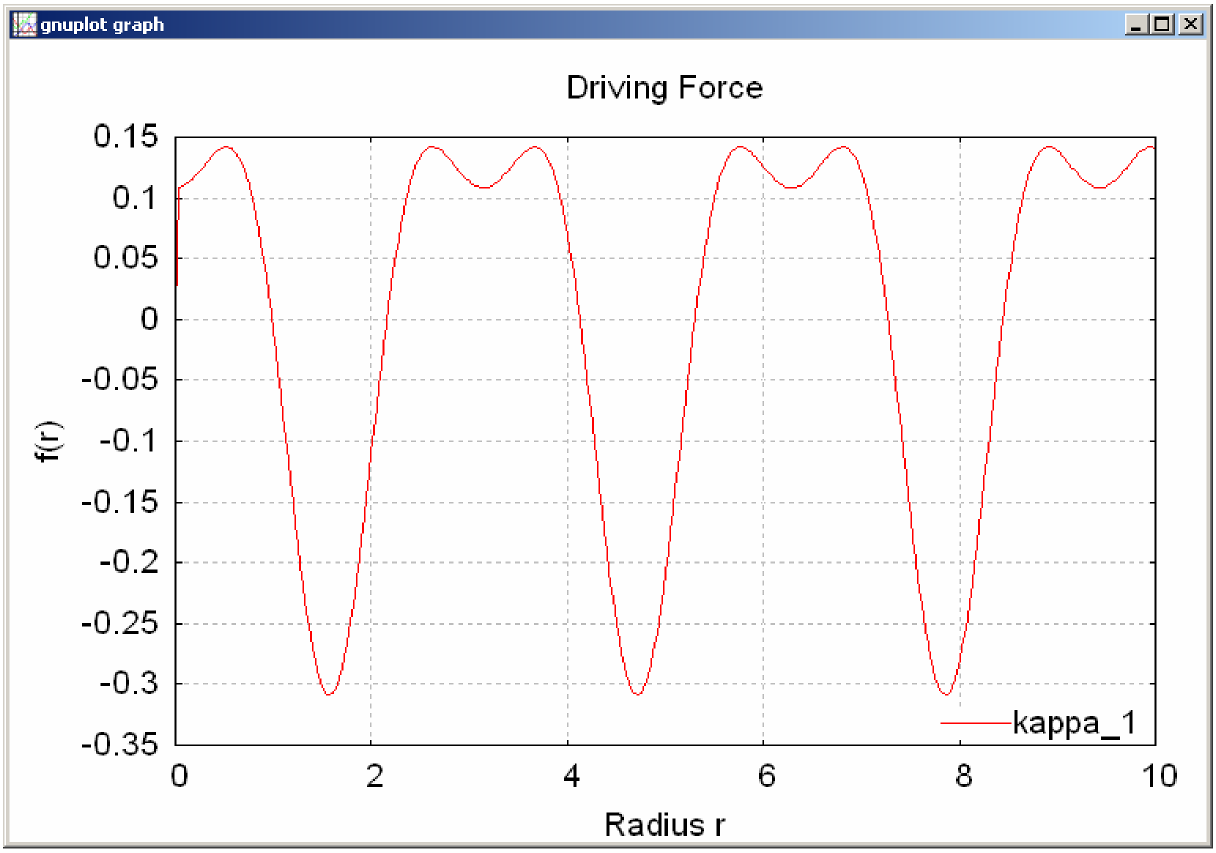

Fig. 4d. Driving force, type 4, κ = 1.

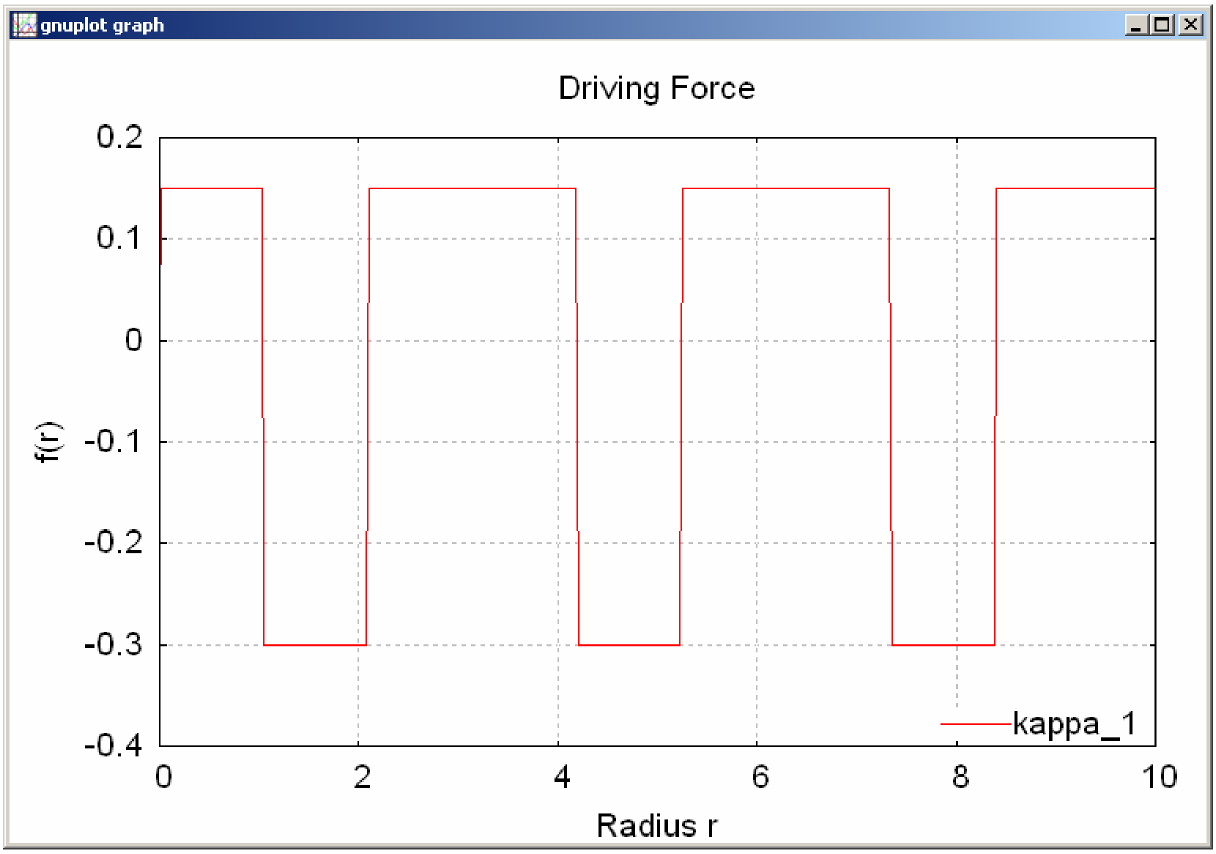

Fig. 4e. Driving force, type 5, κ = 1.

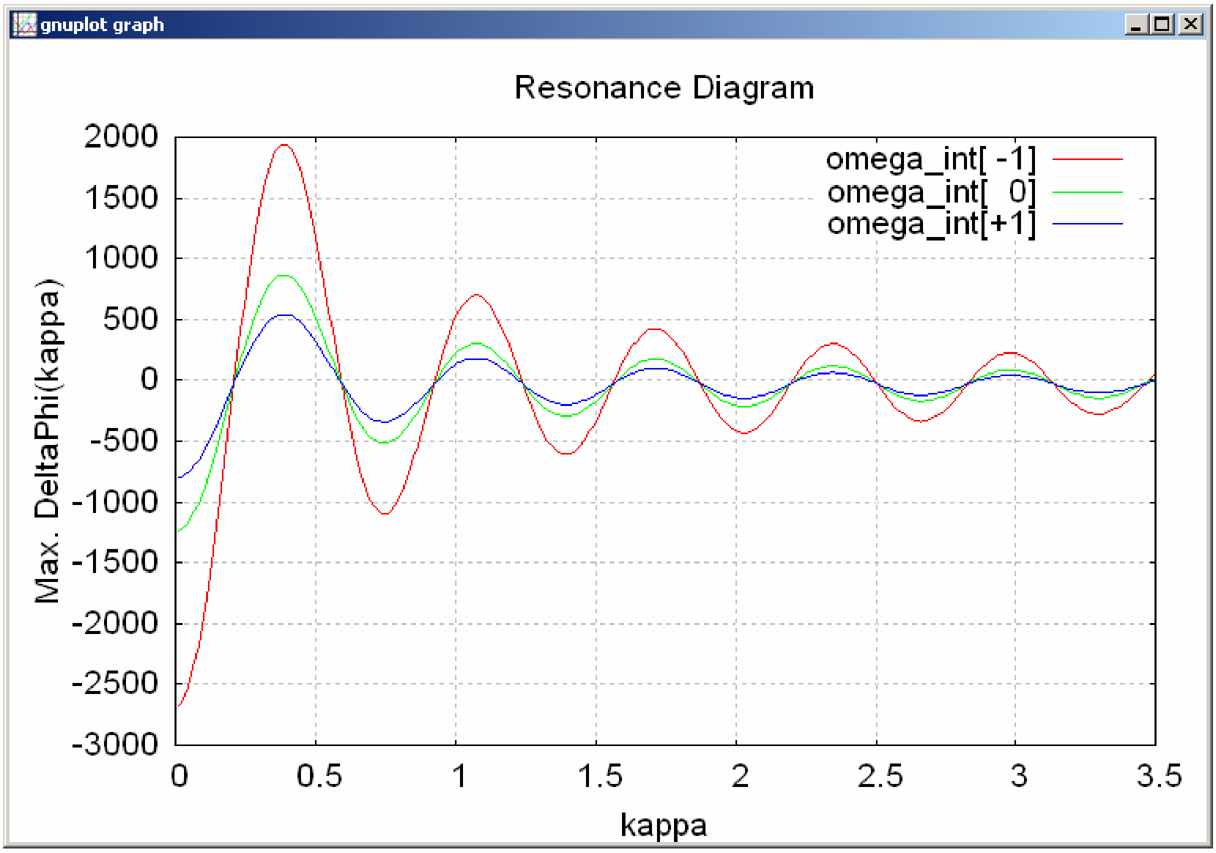

Fig. 5a. Resonance diagram, type 1

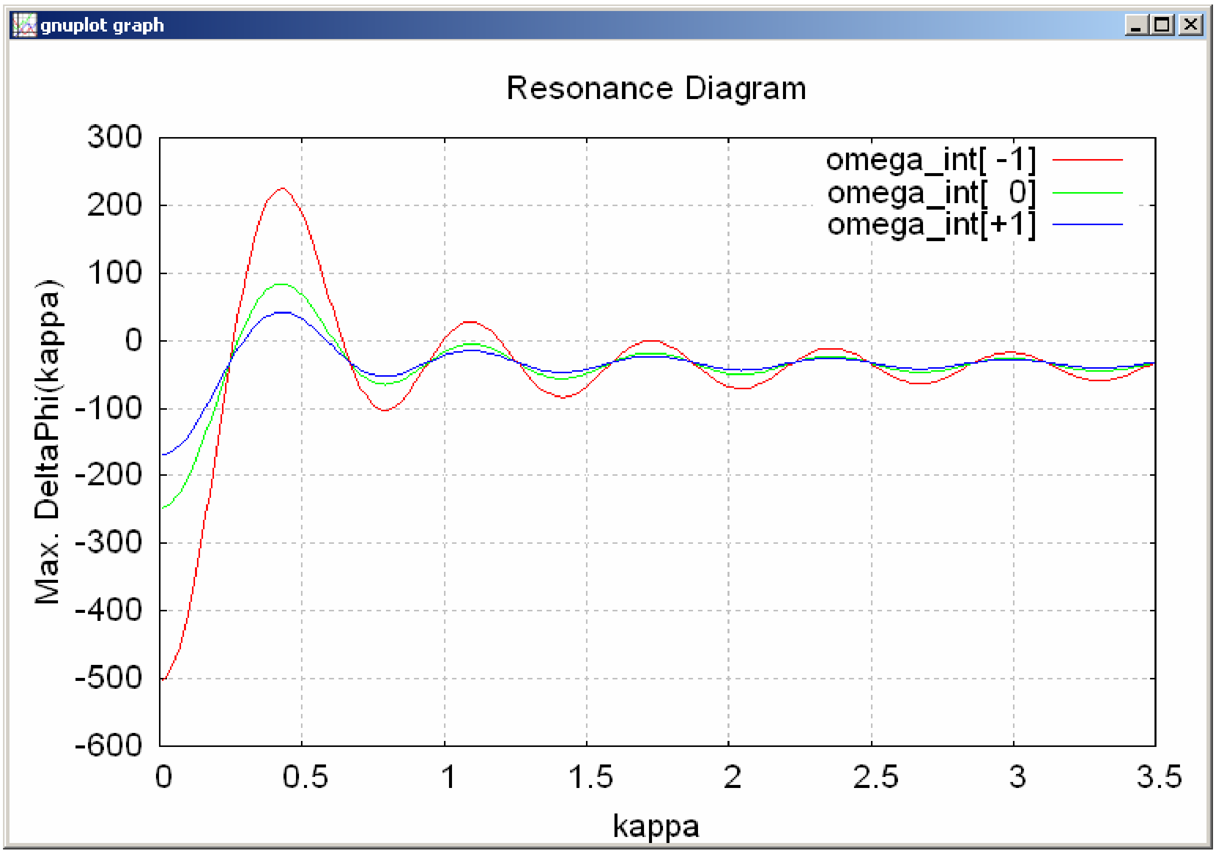

Fig. 5b. Resonance diagram, type 2

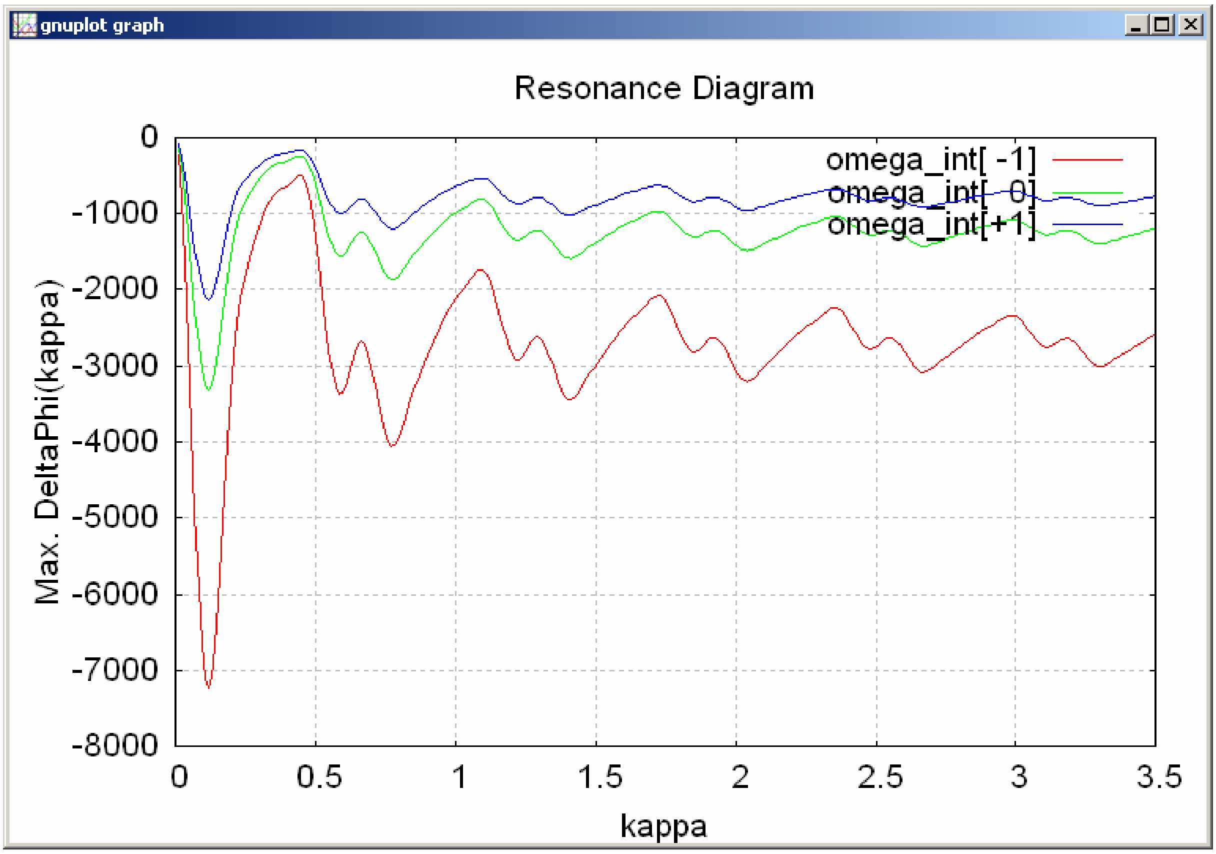

Fig. 5c. Resonance diagram, type 3

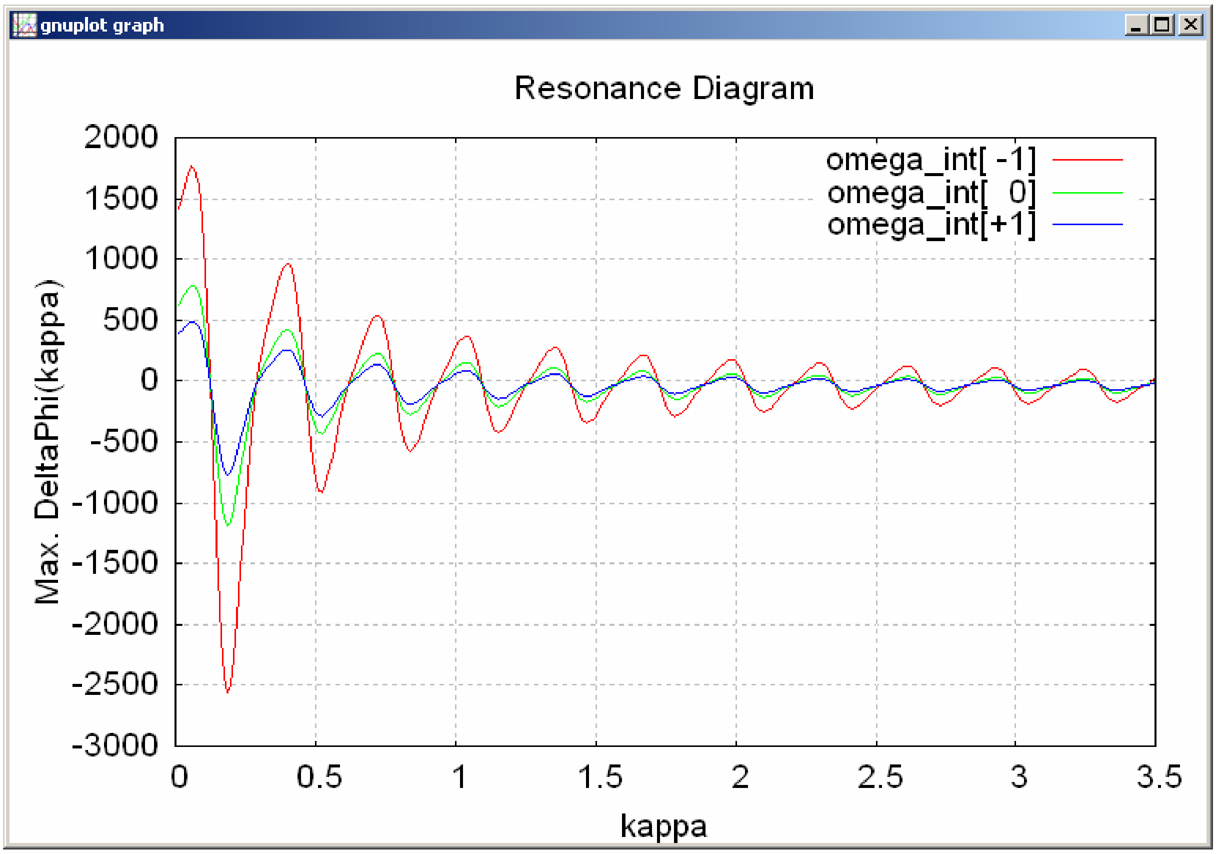

Fig. 5d. Resonance diagram, type 4

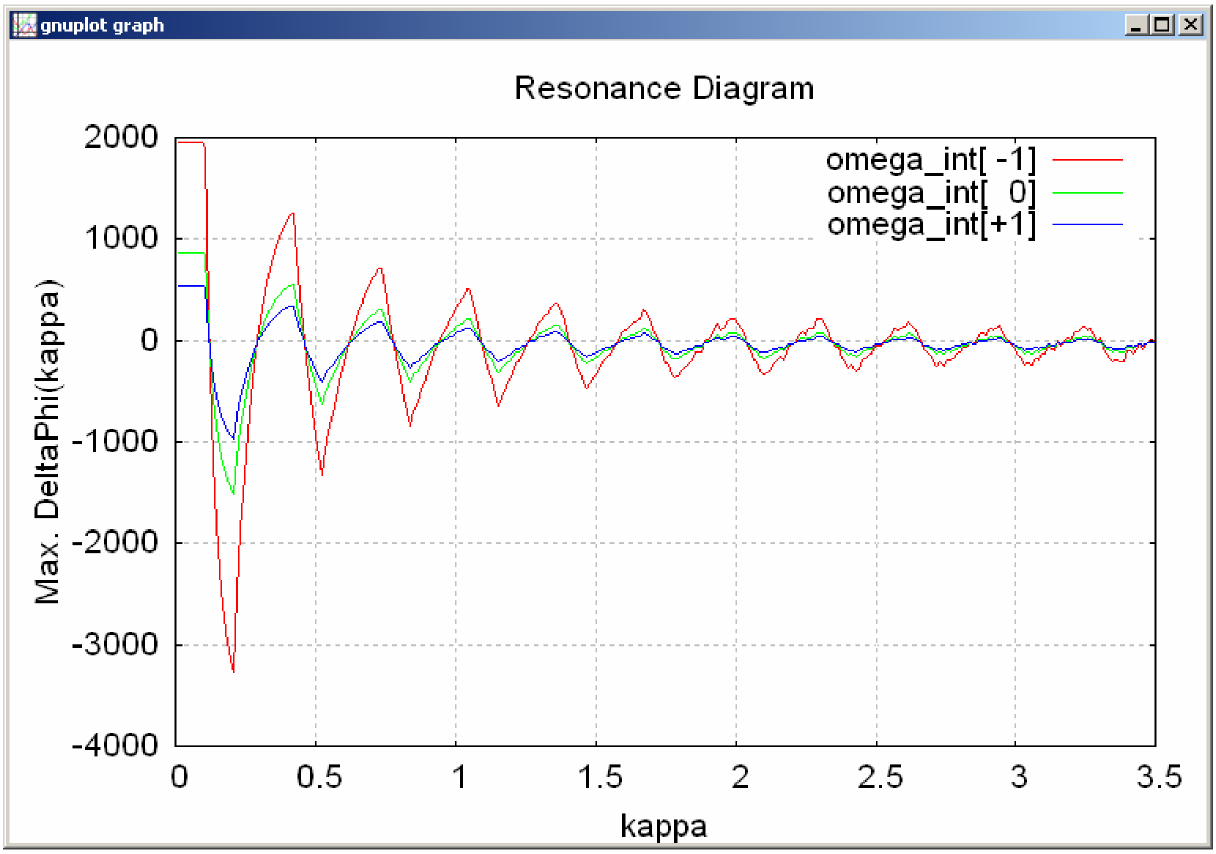

Fig. 5e. Resonance diagram, type 5

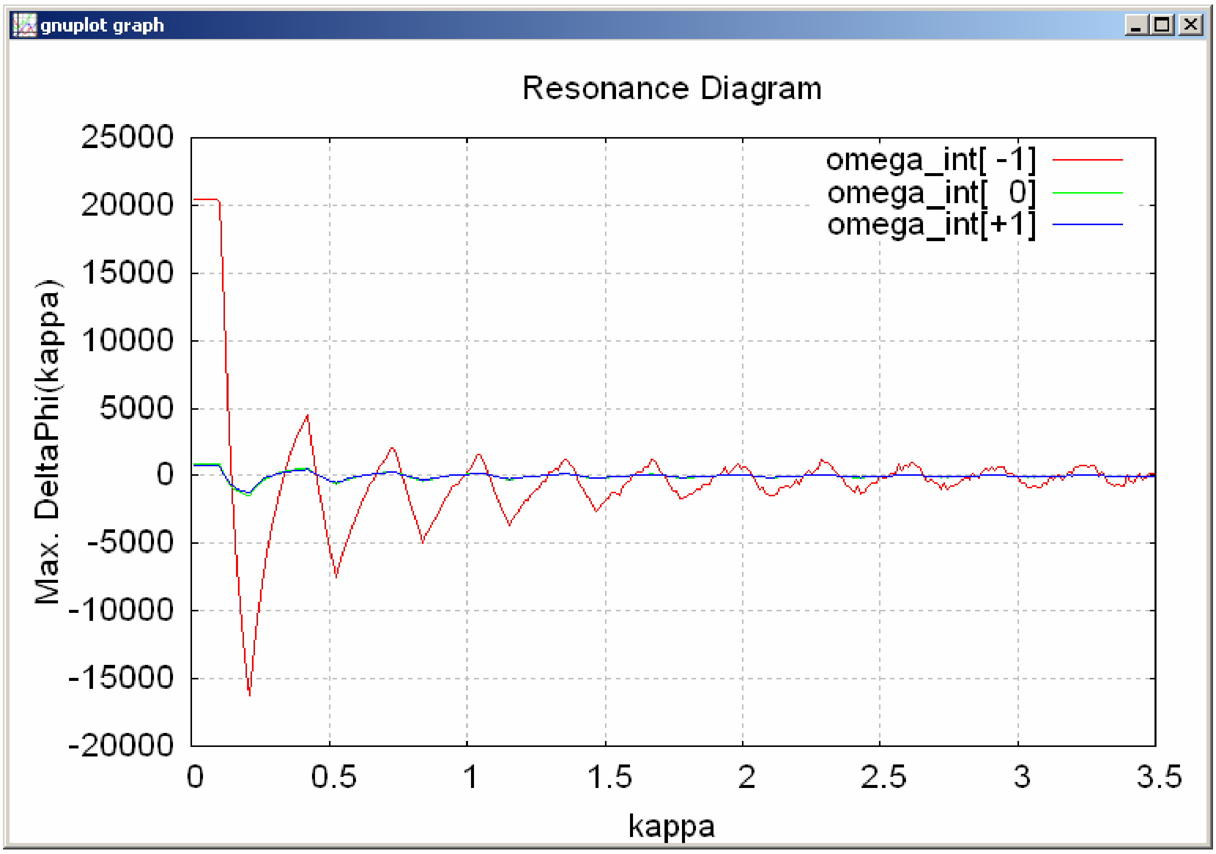

Fig. 6. Resonance diagram for interacting spin connection ~ $1/r^3$, type 5