Dusty plasma consists of electron, ion, neutral particles and micron sized dust particles. Large (~ 10^4 e) amount of charge on each dust particles makes them strongly coupled with neighbors. Hence the system gets some elastic property together with inherent viscous property of a fluid. The elastic property enables the strongly coupled dusty plasma system to support a transverse shear wave of phase velocity 
\[ \rho c_s = \sqrt{\frac{\tau}{\eta}} \]

where \( \eta \) is the viscous coefficient; \( \tau \) is the Maxwell relaxation time, \( \rho \) is the density of the medium [1]. Recent experiment[2] have shown that dusty plasma system shows non-Newtonian behavior i.e, viscosity depends on velocity shear rate. This behavior provides nonlinearity in this system. Hence, we are reporting this non linear effect on elastic shear wave. Non-Newtonian property is modeled through a experimentally justified \( n(s) = n_0 (1 + \alpha s^2) \) Carreau- Bird model. where viscosity coefficient \( \eta \) depends on \( S \) which is function of velocity shear rate. In our case, \( S = \frac{\partial V}{\partial x} \), where \( V \) is the perturbed velocity of the dust fluid. \( \alpha \) is the shear thinning parameter. Hence, nonlinear equation of shear wave propagating along x- direction becomes

\[ \frac{\partial^2 V}{\partial x^2} - \frac{\partial^2 V}{\partial x^2} = n \left( \frac{\alpha}{\eta} \right) \]

all quantities are dimensionalized as \( V \rightarrow \frac{V}{C_{sh}}, T \rightarrow \frac{T}{L}, \tau \rightarrow \frac{C_{sh}}{L} \)

We have solved numerically and observed that initial sinusoidal form will reoccur after going through different periodic structure.

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Figure: Energy plot of different harmonics for different values of \( \alpha \).