Stability of line solitons for the KP-II equation

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The KP-II equation

$$\partial_x(\partial_t u + \partial_x^3 u + 3\partial_x(u^2)) + 3\partial_y^2 u = 0 \quad \text{for } t > 0 \text{ and } (x, y) \in \mathbb{R}^2 \quad \text{(KP-II)}$$

is a 2-dimensional generalization of the KdV equation

$$\partial_t u + \partial_x^3 u + 3\partial_x(u^2) = 0 \quad \text{for } t > 0 \text{ and } x \in \mathbb{R}, \tag{1}$$

which takes slow variations in the transversal direction into account.

In this talk, I will talk about stability of 1-line solitons for the KP-II equation in the class $(1 + x^2)^{-1/2-0}H^1(\mathbb{R}^2_{x,y})$. The essential feature of modulation of line solitons is that it is not desribed by ODEs but by a Burgers' system. This is related to the fact that the linearized operator has resonant continuous eigenvalues around $\lambda = 0$ whose eigenmodes grow exponentially as $x \to -\infty$.