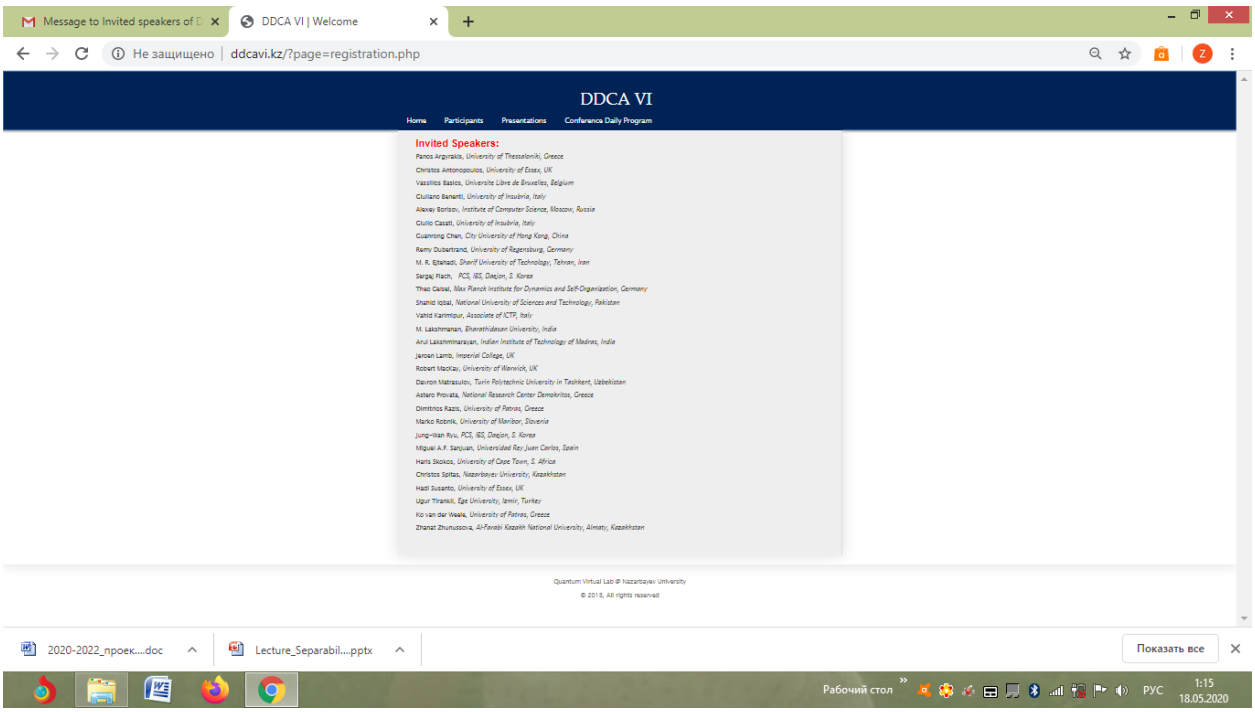
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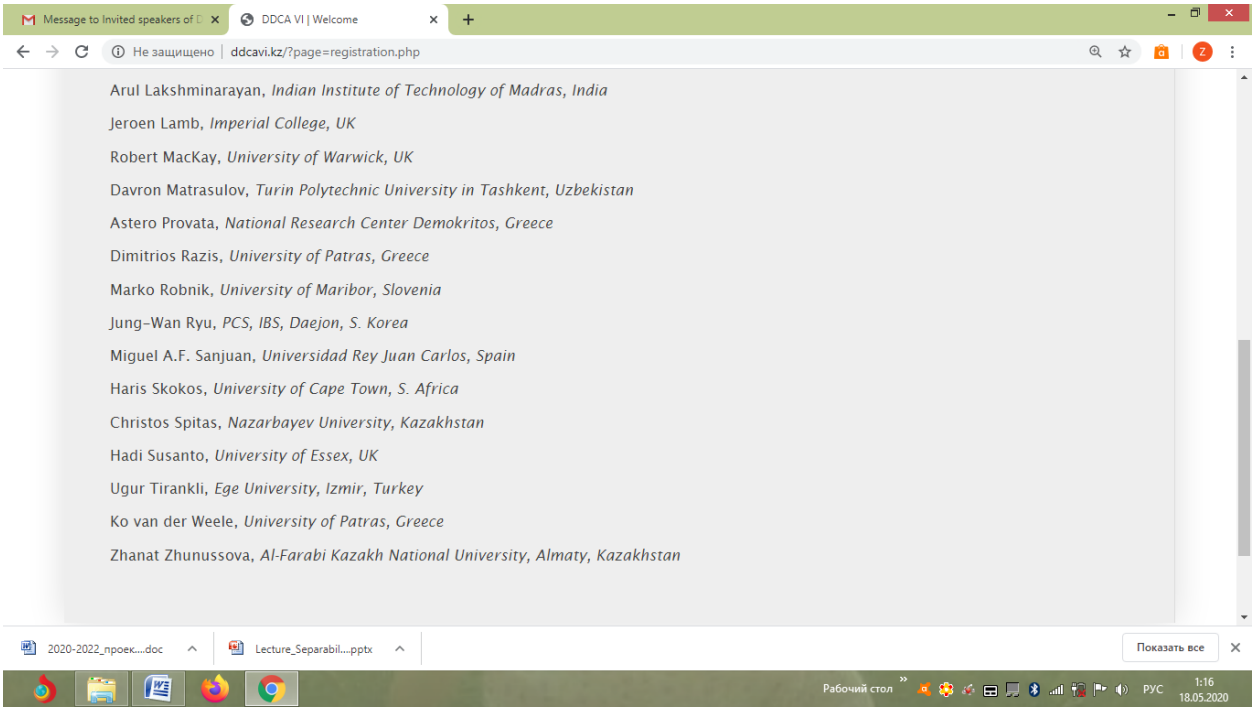
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Steady states of the modified Heisenberg equation

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The steady states and traveling wave solutions of the Heisenberg and M-I spin systems have been considered before [1]. Analitically 1+1 Heisenberg spin system of PDEs on the unit sphere is solved. Moreover for solving traveling waves of the Heisenberg spin system we proceed by using spherical coordinates on the unit sphere. Two cases for finding traveling waves of M-I spin system are considered. In the 1st case the function u is a constant and in the second case the functions u is $u(\eta)$. We note that M-I system is 2+1, Heisenberg equations are 1+1 dimensions. In the case of the continuum Heisenberg system in 1+1 the corresponding Landau-Lifshitz-Gilbert (LLG) equation takes the form with using the small damping parameter [2]-[3]

$$\vec{S}_t = \vec{S} \times \vec{S}_{xx} + \lambda(\vec{S}_{xx} - (\vec{S} \cdot \vec{S}_{xx})\vec{S}), \vec{S} = (u, v, w), u^2 + v^2 + w^2 = 1 \qquad (1)$$

Also the equation of motion can be written as

$$\frac{d\vec{S}(t)}{dt} = -\gamma_0 \left[\vec{S}(t) \times \vec{H}(t)\right] + \lambda\gamma_0 \left[\vec{S} \times \frac{d\vec{S}}{dt}\right], \ \lambda \ll 1.$$

The equation (1) is the isotropic case of LLG equation. We know that this equation can be mapped to an equivalent the damped nonlinear Schrödinger equation. To

calculate LLG equation with a small damping parameter we need to describe LLG equation for the isotropic case. And then based on isotropic case we can find isotropic chain with Gilbert damping. In the previous article the graph is constructed by plotting u, v, w variables as functions. Currently by using damping parameter the graph changes to damped sinusoid which can be illustrated.

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