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ROTATION CURVES OF SPIRAL GALAXIES AND MASSIVE NEUTRINOS

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Abstract. In this thesis the nature of matter in spiral galaxies is discussed. Rotation curves of spiral galaxies represent most probably the best evidence that a significant amount of dark matter is present in their content. It is shown that apart from baryonic, in the Universe most probably there exists a significant amount of nonbaryonic matter that has not been detected so far. By taking into account this, the problem of dark matter in spiral galaxies and its detection has been discussed. As an interesting candidate for the constituent of nonbaryonic dark matter there is a massive neutrino, especially in the optics of the recently published results of the Super-Kamiokande team. The emphasis is put on the decaying neutrino with the mass $m_\nu \sim 30$ eV. Two big samples of rotation curves have been analyzed – first of about 1000 galaxies and a second one with about 130 galaxies. It is shown that neutrinos with mass of $m_\nu \sim 30$ eV can give the biggest contribution to the mass of spiral galaxies. The basic concepts of the decaying dark matter (DDM) theory have been presented together with its successes, and failures. The detection of the dark matter in the form of decaying neutrinos has been analyzed. Finally, conclusions on the place of the massive neutrinos with mass of $m_\nu \sim 30$ eV in the modern theories have been drawn.