The portrait of Malin 2: on the general structure of the giant low surface brightness galaxy

Kasparova A.[1], **Saburova A.**[1], **Katkov I.**[1], **Chilingarian I.**[2,1] **and Bizyaev D.**[3,1]

[1] Sternberg Astronomical Institute, Moscow M.V. Lomonosov State University, Universitetskij pr., 13, Moscow, 119992, Russia

[2] Smithsonian Astrophysical Observatory, Harvard-Smithsonian Center for Astrophysics, 60 Garden St. MS09, Cambridge, MA 02138, USA

[3] New Mexico State University and Apache Point Observatory, PO Box 59, Sunspot, NM 88349, USA

The aim of this work is to design a coherent picture of the exotic galaxy Malin 2 by using the optical multicolor surface photometry and the kinematic measurements from the long slit spectra as well as the literature data. Malin 2 challenges the "standard" evolutionary theory due to the enormous total mass of this *disc* galaxy ($\sim 2 \cdot 10^{12}$ $M_\odot$) which must be formed without any recent major merger events. We constructed the mass model to estimate the contribution of the host dark halo having acquired its unique properties (the low central density $\rho_0 \simeq 0.003$ $M_\odot/pc^3$ and the huge core radius $r_c =$ 27.3 kpc of isothermal sphere) before the formation of the disc subsystem. We argue that this is the main reason for the features of Malin 2 and there is no need to assume additional "catastrophic" scenarios implied usually in the case of giant LSB galaxies. One of the unique peculiarities is the apparent misbalance of interstellar media, namely, the molecular gas excess in relation to atomic gas for given values of the gas equilibrium turbulent pressure. We discuss that it can be explained by the presence of a significant portion of the dark gas unobserved by CO lines and 21 cm. We also show that the depletion time of apparent molecular gas traced by CO is nearly the same that of the normal galaxies. The modeling of the spectral energy distribution indicates the exponentially declined star formation history for Malin 2.