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New model of the coherent magnetic halo of the Milky Way and cosmic ray propagation

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I will present a new model of the coherent Galactic magnetic field outside of the thin disk. The model was fitted to the most recent catalog of extragalactic Faraday rotation measures (RM) and synchrotron polarization data (Stokes Q and U). The model is based on several phenomenological components of the GMF – the spiral arms, the toroidal halo, the X-shaped field and the compressed field of the Local Bubble wall. Our model for the first time takes into account our location inside of the Local Bubble. We show that the Local Bubble wall might be responsible for about 50% of the polarized emission at high Galactic latitudes and so our model does not require introduction of striated fields invoked in previous models. Also we show that the Fan Region can be modeled as a Galactic-scale feature. The pitch angle of the magnetic field in our fit converged to the value around 20 degrees. Interestingly, with value is very close to the direction of arms inferred recently from Gaia data. At the end, I will discuss the implications of our new model for the propagation of cosmic rays.

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