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A Light Sterile Neutrino from Soft broken Friedberg-Lee Symmetry

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Light sterile neutrinos of mass about an eV with mixing U_{ls} of a few percent to active neutrinos may solve some anomalies shown in experimental data related to neutrino oscillation. How to have light sterile neutrinos is one of the theoretical problems which have attracted a lot of attentions. In this article we show that such an eV scale light sterile neutrino candidate can be obtained in a seesaw model in which the right-handed neutrinos satisfy a softly-broken Friedberg-Lee symmetry. In this model a right-handed neutrino is guaranteed by the FL symmetry to belight comparing with other two heavy right-handed neutrinos. It can be of eV scale when the FL symmetry is softly broken and can play the role of eV scale sterile neutrino needed for explaining the anomalies of experimental
data. This model predicts that one of the active neutrino is massless. We find that this model prefers inverted hierarchy mass pattern of active neutrinos than normal hierarchy. An interesting consequence of this model is that realizing relatively large U_{es} and relatively small U_{\mu s} in this model naturally leads to a relatively small U}_{tau s}|A Light Sterile Neutrino from Freidberg-Lee Symmetry. We also comment on some cosmological implications of this type of model, such as the possibility of having the sterile neutrino of a few KeV as dark matter and also constraining sterile neutrino mass from Planck data.

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