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Tau Vector and Axial Vector Spectral Functions in the Extended Linear Sigma Model

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Low energy resonances appear as final states of the processes that are produced in proton-proton collisions. Thus, in order to analyse the results that will be obtained by the PANDA experiment, it is necessary to control the low energy sector of hadron spectroscopy. The extended Linear Sigma Model (eLSM) describes scalar, pseudoscalar, vector and axial-vector meson resonances, the glueball, and the tetraquark, as well as baryons, on the basis of a Lagrangian that is invariant under global chiral symmetry transformations and dilatation. In addition, for \(N_F=2\), we have now included the electroweak interaction on the basis of a local \(SU(2)_L\times U(1)_Y\) symmetry. Thus we have all components available to compute the coherent amplitudes that yield the vector and axial-vector spectral functions of the weak \(\tau\)-decay with intermediate \(a_1\) and \(\rho\) resonances. We find that within the framework of the eLSM the assumption that the \(\rho\) and \(a_1\) meson resonances are quarkonia and chiral partners is valid. We will also see that the obtained weak spectral functions give a nice illustration of Vector Meson Dominance in the weak sector of meson vacuum phenomenology.

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