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Anomaly sum rules for the case of a singlet current and their features

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We generalize the dispersive approach to axial anomaly by A.D. Dolgov and V.I. Zakharov to a non-Abelian case with arbitrary photon virtualites. We derive the anomaly sum rule for the singlet current and obtain the $\pi^0, \eta, \eta' \to \gamma\gamma^{(*)}$ transition form factors. Using them, we established the behavior of a non-perturbative gluon matrix element $\langle 0|G\tilde{G}|\gamma\gamma^{(*)}\rangle$ for the case of a real photons and for the case of a one virtual photon in both space-like and time-like regions. We found a significant contribution of the non-Abelian axial anomaly to the processes with one virtual photon, comparable to that of the electromagnetic anomaly. The duality between the axial and the vector channels was observed: the values of duality intervals and mixing parameters in the axial channel were related to vector resonances' masses and residues. The possibility of a light pseudoscalar glueball-like state is conjectured.

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