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Anomalous enhancement of dilepton production due to soft modes in dense quark matter

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A major focus of recent experiments in heavy-ion collisions is to reveal rich phase structure in high baryon density matter: the first-order chiral transition line with the QCD critical point, CSC phase transition and so on. Such experiments include the beam-energy scan program at RHIC, and HADES and NA61/SHINE collaborations as well as those to be performed in future experimental facilities such as FAIR, NICA and J-PARC-HI. In the present report, we calculate how the soft modes that develop around CSC phase transition and QCD critical point, affect the dilepton production rate based on the two-flavor NJL model. It is demonstrated that Aslamazov-Larkin, Maki-Thompson and DOS terms due to the soft modes, which are known to give rise to anomalous excess of electric conductivity in metals, modify the photon self-energy so greatly that the dilepton production rates is enhanced anomalously at the low energy region.

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