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Benjamini--Schramm continuity of root moments of graph polynomials

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Recently, M.\ Ab\'ert and T.\ Hubai studied the following problem. The chromatic measure of a finite simple graph is defined to be the uniform distribution on its chromatic roots. Ab\'ert and Hubai proved that for a Benjamini-Schramm convergent sequence of finite graphs, the chromatic measures converge in holomorphic moments. They also showed that the normalized log of the chromatic polynomial converges to a harmonic real function outside a bounded disc.

In this paper we generalize their work to a wide class of graph polynomials, namely, multiplicative graph polynomials of bounded exponential type. A special case of our results is that for any fixed complex number v_0 the measures arising from the Tutte polynomial $Z_{G_n}(z,v_0)$ converge in holomorphic moments if the sequence (G_n) of finite graphs is Benjamini--Schramm convergent. This answers a question of Ab\'ert and Hubai in the affirmative. Even in the original case of the chromatic polynomial, our proof is considerably simpler.

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