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On the semicircular law of large-dimensional random quaternion matrices. (English)

Summary: It is well known that the Gaussian symplectic ensemble is defined on the space of \( n \times n \) quaternion self-dual Hermitian matrices with Gaussian random elements. There is a huge body of literature regarding this kind of matrices based on the exact known form of the density function of the eigenvalues (see [L. Erdős, Russ. Math. Surv. 66, No. 3, 507–626 (2011); translation from Usp. Mat. Nauk. 66, No. 3, 67–198 (2011; Zbl 1230.82032); L. Erdős et al., Probab. Theory Relat. Fields 154, No. 1–2, 341–407 (2012; Zbl 1277.15026); Adv. Math. 229, No. 3, 1435–1515 (2012; Zbl 1238.50177); A. Knowles and J. Yin, Probab. Theory Relat. Fields 155, No. 3–4, 543–582 (2013; Zbl 1268.15033); T. Tao and V. Vu, Acta Math. 206, No. 1, 127–204 (2011; Zbl 1217.15044); Electron. J. Probab. 16, Paper No. 77, 2104–2121 (2011; Zbl 1245.15041)]. Due to the fact that multiplication of quaternions is not commutative, few works about large-dimensional quaternion self-dual Hermitian matrices are seen without normality assumptions. As is natural, we shall get more universal results by removing the Gaussian condition. For the first step, in this paper, we prove that the empirical spectral distribution of the common quaternion self-dual Hermitian matrices tends to the semicircular law. The main tool to establish the universal result is given as a lemma in this paper as well.

MSC:

- 60F05 Central limit and other weak theorems
- 60B20 Random matrices (probabilistic aspects)
- 60F15 Strong limit theorems
- 62E20 Asymptotic distribution theory in statistics

Keywords:
random quaternion matrices; semicircular law

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References:

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