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Fat-tail vs. critical random matrix ensembles JINMYUNG CHOI, KHANDKER A. MUTTALIB, University of Florida — Recently, we reported a family of novel fat-tail random matrix ensembles characterized by a parameter λ in "Rotationally invariant family of Levy like random matrix ensembles", J. Phys. A: Math. Theor. 42, 152001 (2009). It was shown that i) the eigenvalue densities of the ensembles exhibit a power law distribution, the exponent of which depends on the parameter λ, and ii) the two-level correlation of the ensembles is qualitatively different from that of the Gaussian or the critical ensembles. Here we investigate the Levy-like ensembles in comparison with the critical ensembles, corresponding to $\lambda \rightarrow 1$, particularly in the vicinity of $\lambda = 1$. The study shows that the Levy-like ensembles exhibit characteristics similar to the critical ensembles in terms of the anomalous two-level correlations, i.e. the ghost peak, and the form factor (power spectrum). We discuss these results in the context of well known properties of the critical ensembles, e.g., spontaneous symmetry breaking, multi-fractality as well as in relation to the systems showing $1/f^{\alpha}$ noise.

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