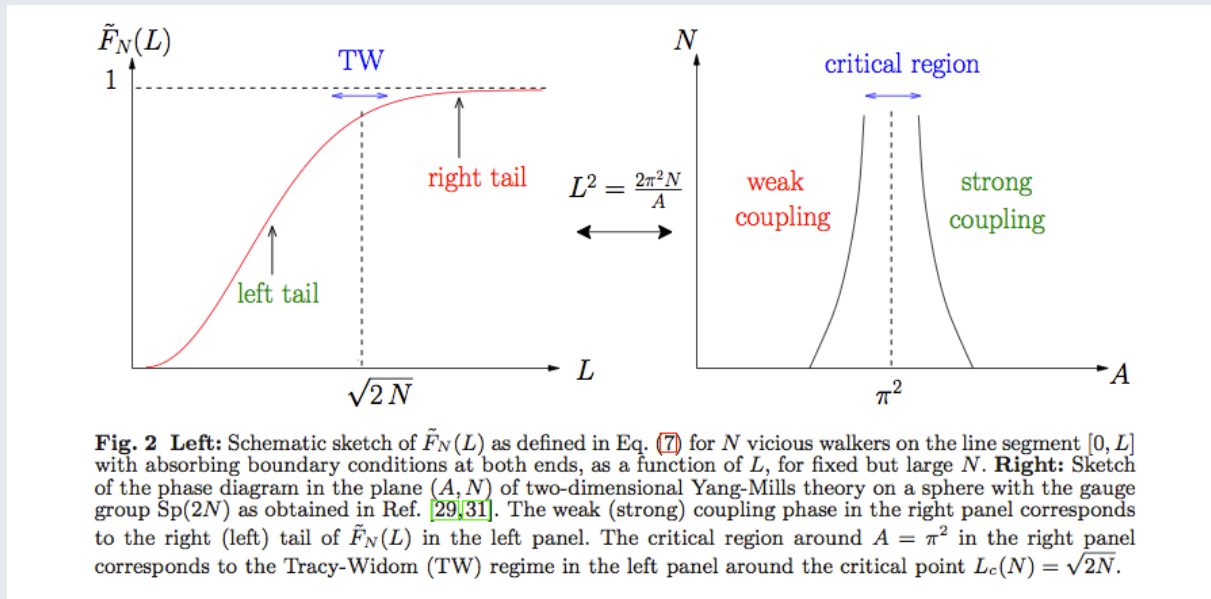# Random matrices and applications

Pierpaolo Vivo (LPTMS), Grégory Schehr (LPT)

The project Randmat as devised by the proponents has so far produced remarkable scientific outcomes, testified by 21 peer-reviewed papers appeared in the years 2012-2013, as well as 19 invited talks for the proponents (including in USA, Canada, Japan or India), and the participation to around 25 international gatherings. Two out of three main projects belonging to the original proposal have been so far tackled in detail, namely the statistical properties of configurations of many brownian walkers (1) and the theory of electronic transport in non-ideal chaotic cavities (2). Gregory Schehr's activity in point (1) focused in particular on the application of non-intersecting Brownian motions to the study of extreme statistics of stochastic growth processes in the Kardar-Parisi-Zhang universality class. The study of near extreme statistics of non-intersecting Brownian motion is also an important part of G. Schehr's PhD student, A. Perret. P. Vivo's activity in point (2) has been devoted to the study of entanglement production in nonideal cavities, as well as the study of quantum transport in weakly nonideal cavities, in collaboration with a Ph.D. student (Ricardo Marino). Other projects undertaken concern the large deviation of top eigenvalue in Cauchy random matrices (joint work with G. Schehr), the study of invariant beta-Wishart ensembles and the statistics of ratios between adjacent spacings in random matrices.

Fig. 2 Left: Schematic sketch of $\tilde{F}_N(L)$ as defined in Eq. (7) for N vicious walkers on the line segment $[0, L]$ with absorbing boundary conditions at both ends, as a function of L, for fixed but large N. **Right:** Sketch of the phase diagram in the plane (A, N) of two-dimensional Yang-Mills theory on a sphere with the gauge group $\mathrm{Sp}(2N)$ as obtained in Ref. [29,31]. The weak (strong) coupling phase in the right panel corresponds to the right (left) tail of $\tilde{F}_N(L)$ in the left panel. The critical region around $A = \pi^2$ in the right panel corresponds to the Tracy-Widom (TW) regime in the left panel around the critical point $L_c(N) = \sqrt{2N}$.

As far as the invitation of foreign experts is concerned, several invitations have been turned down due to time constraints and other commitments on the receiving part, but we have received confirmation for the visit of Isaac Perez Castillo (UNAM) and Zdzislaw Burda (Krakow) in 2014 for scientific visits of 2-3 weeks. Shorter visits will be planned for Dmitry Savin (Brunel,London), Yan Fyodorov (Queen Mary,London) and Reimer Kuehn (King's College, London), while the collaboration with P. J. Forrester will be fostered with a visit of Gregory Schehr to Australia in January 2014.

R. Marino, SN Majumdar, G. Schehr, P. Vivo, P, *Phase Transitions and Edge Scaling of Number Variance in Gaussian Random Matrices*, Physical Review Letters, 112, 25, 254101 (2014)