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**Igor Rumanov\*** ([igor.rumanov@colorado.edu](mailto:igor.rumanov@colorado.edu)), Dept. of Applied Mathematics, University of Colorado Boulder, 526 UCB, Boulder, CO 80309. *Quantum Painleve II (QP II) and Tracy-Widom distribution for  $\beta = 6$ .*

Quantum Painleve equations (QPE) are Fokker-Planck (or non-stationary Schroedinger) equations in two independent variables (“time” and “space”) with diffusion-drift operators being quantized Painleve Hamiltonians. QPE are satisfied by certain eigenvalue probabilities of random matrix beta ensembles and are instances of Belavin-Polyakov-Zamolodchikov (BPZ) equations of conformal field theory. We construct classical integrable structure associated with linear QP II PDE, more explicit for even integer beta. Our main result is a second order nonlinear ODE for the log-derivative of Tracy-Widom distribution for  $\beta = 6$ , involving the (Hastings-McLeod) Painleve II function in the coefficients. The nonlinear PDEs derived from QP II possess Painleve PDE property for all values of beta. Its general solutions are related by a Cole-Hopf transform with two linearly independent solutions of QP II. (Received August 15, 2016)