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”Integrable” gap probabilities for the Generalized Bessel process

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We consider the gap probability for the Generalized Bessel process, a determinantal point process which arises as critical limiting kernel near the hard edge of the spectrum of a certain random matrix ensemble. We prove that such probability can be expressed in terms of the Fredholm determinant of a suitable Its-Izergin-Korepin-Slavnov integrable operator and linked in a canonical way to Riemann-Hilbert (RH) problem. Starting from the RH problem, we can construct a Lax pair and link the gap probability to the Painlevè III hierarchy. Moreover, we are able to construct a system of two coupled Hamiltonians which can be hopefully identified with the 2-dimensional Garnier system LH(2+3).
The talk is based on some previous results and an on-going project with Dr. Mattia Cafasso (Université Angers, France).

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