

## LAYERING OF THE POISSON PROCESS IN THE QUADRANT

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*Abstract:* We consider the increasing sequence of non-intersecting monotone decreasing step processes  $Y_n^*(t)$ ,  $n = 1, 2, \dots$  ( $t > 0$ ), whose jump points cover all the points of the homogeneous rate 1 Poisson process on the quadrant  $R_+^2$ . We derive properties of these processes, in particular the marginal distributions  $\mathbf{P}(Y_n^*(t) > x)$ , in terms of a Toeplitz determinant of some modified Bessel functions. Our system provides a new view of the Hammersley interacting particle system discussed by Aldous and Diaconis, and the distributions we derive are related to the distribution of the length of the longest ascending sequence in a random permutation.

**1991 AMS Mathematics Subject Classification:** Primary: -; Secondary: -;

**Key words and phrases:** Planar Poisson process,  $k$ th layer process, modified Bessel function, Hammersley interacting particle system, longest increasing subsequence, Ulam problem, random permutation.

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