Newman, Charles; **Tassion, Vincent**; **Wu, Wei**
Critical percolation and the minimal spanning tree in slabs. (English) Zbl 1380.82025
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Authors' abstract: The minimal spanning forest on $\mathbb{Z}^d$ is known to consist of a single tree for $d \leq 2$ and is conjectured to consist of infinitely many trees for large d. In this paper, we prove that there is a single tree for quasi-planar graphs such as $\mathbb{Z}^2 \times \{0, \dots, k\}^{(d-2)}$. Our method relies on generalizations of the "gluing lemma" of *H. Duminil-Copin* et al. [Commun. Pure Appl. Math. 69, No. 7, 1397–1411 (2016; Zbl 1342.82076)]. A related result is that critical Bernoulli percolation on a slab satisfies the box-crossing property. Its proof is based on a new Russo-Seymour-Welsh-type theorem for quasi-planar graphs. Thus, at criticality, the probability of an open path from 0 of diameter n decays polynomially in n. This strengthens the result of Duminil-Copin et al. [loc. cit.] where the absence of an infinite cluster at criticality was first established.

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