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On the Effective Version of Serre's Open Image Theorem

Let $E/\mathbb{Q}$ be an elliptic curve without complex multiplication. By Serre's open image theorem, the mod ℓ Galois representation of E is surjective for each prime number ℓ that is sufficiently large. Under GRH, we obtain the best explicit upper bound on the largest non-surjective prime in terms of the conductor of E. This makes effective a bound of the same asymptotic quality due to Larson and Vaintrob. We also illustrate the efficiency of the bound using an elliptic curve with large conductor in LMFDB. This is a joint work with Jacob Mayle.