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Sean Howe* (seanpkh@gmail.com). *Presentations of S -unit groups of quaternions algebras ramified at infinity and applications to the congruence subgroup problem.* Preliminary report.

For k a number field and \mathcal{B}/k a quaternion algebra totally ramified at infinity, and for S a sufficiently large set of places of k , we give an algorithm to determine a presentation of the S -units of \mathcal{B} modulo scalars. The algorithm calculates a presentation based on a fundamental domain for the action of the S -units on a product of Bruhat-Tits trees given by Chinburg and Stover (arXiv:1204.5968) in their work on finding generators for S -units of division algebras, combined with either Bass-Serre theory or a theorem of MacBeath on presentations of groups acting on simply connected topological spaces. In the case of the Hamiltonian quaternions over \mathbb{Q} , the resulting presentations take a particularly nice form, with potential applications to the congruence subgroup problem for the corresponding algebraic groups. For example, we show that for p an odd prime such that $p \equiv 2 \pmod{3}$, the $\{p, \infty\}$ -units of the Hamiltonian quaternions admit a surjective morphism to $PSL_2(\mathbb{Z})$. This talk is based on work begun at the 2012 Arizona Winter School and is joint work with the other members of Chinburg and Stover's Arizona Winter School project group. (Received September 23, 2012)