

On the decomposition numbers of Steinberg's triality groups ${}^3D_4(2^n)$

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Abstract. Let G be the simple Steinberg's triality groups ${}^3D_4(q)$, where q is power of prime p . The investigation of the decomposition numbers of G was begun by M. Geck. He computed the l -modular decomposition matrices of G in all odd characteristics $l \neq p$ explicitly up to a few entries and calculated an approximation to the 2-modular decomposition matrix. In 2007, F. Himstedt determined the 2-modular decomposition matrix of G except for two entries in the Steinberg character. The case for $p = 2$ is still an open question. The goal of this talk is to report a recent joint work with F. Himstedt on the decomposition numbers of ${}^3D_4(2^n)$. We determine the l -modular decomposition matrices of ${}^3D_4(2^n)$ for all primes $l \neq 2$ except for some entries in the unipotent characters. As an application, we use the decomposition matrices to classify all absolutely irreducible representations of ${}^3D_4(2^n)$ in non-defining characteristic up to a certain degree, solving a problem proposed by P. H. Tiep and A. E. Zalesskii.
