

Characters of graded parafermion conformal field theory

Jean-François Fortin¹, Pierre Mathieu², and S. Ole Warnaar³

¹Department of Physics and Astronomy, Rutgers, The State University
of New Jersey, Piscataway, NJ 08854-8019, USA
jffor27@physics.rutgers.edu

²Département de Physique, de Génie Physique et d'Optique,
Université Laval, Québec, Canada G1K 7P4
pmathieu@phy.ulaval.ca

³Department of Mathematics and Statistics, The University of Melbourne,
VIC 3010, Australia
warnaar@ms.unimelb.edu.au

Abstract

The graded parafermion conformal field theory at level k is a close cousin of the much-studied $\mathbb{Z}_k$ parafermion model. Three character formulas for the graded parafermion theory are presented, one bosonic, one fermionic (both previously known), and one of spinon type (which is new). The main result of this paper is a proof of the equivalence of these three forms using q -series methods combined with the combinatorics of lattice paths. The pivotal step in our approach is the observation that the graded parafermion theory — which is equivalent to the coset $\widehat{\mathfrak{osp}}(1, 2)_k / \widehat{\mathfrak{u}}(1)$ — can be factored as $(\widehat{\mathfrak{osp}}(1, 2)_k / \widehat{\mathfrak{su}}(2)_k) \times (\widehat{\mathfrak{su}}(2)_k / \widehat{\mathfrak{u}}(1))$, with the two cosets on the right equivalent to the minimal model $\mathcal{M}(k + 2, 2k + 3)$ and the $\mathbb{Z}_k$ parafermion model, respectively. This factorization allows for a

Work supported by FQRNT (JFF), NSERC (PM) and ARC Centre of Excellence
MASCOS (SOW).

e-print archive: <http://lanl.arXiv.org/abs/arXiv:hep-th/0602248>