

Junior Hausdorff Trimester Program
Mathematical Physics

Report on the activities of Group D - “BPS states”

Sven Meinhardt and Jacopo Stoppa

The activities of Group D “BPS States” did not focus on a single open problem, but rather reflected the different interests of its members (both physicists and mathematicians): Nils Carqueville, Ben Davison, Mario Garcia-Fernandez, Stefan Hohenegger, Jan Manschot, Sven Meinhardt, Jacopo Stoppa, Tom Sutherland.

The common theme was provided by the concept of a Bogomolny-Prasad-Sommerfield state in a physical theory (which arose first in the study of certain gauge theories) and its different incarnations in mathematical physics, algebraic geometry and differential geometry.

More specifically, the algebra, geometry and physics of BPS states were investigated in the contexts of topological field theory (Carqueville), supersymmetric gauge and string theories (Hohenegger, Manschot), Donaldson-Thomas theory (Davison, Meinhardt, Stoppa), cohomological Hall algebras (Davison, Meinhardt), geometric aspects of stability conditions on categories (Garcia-Fernandez, Stoppa, Sutherland).

Altogether the activities of the group led to 7 publications, which are listed as preprints **2012c06**, **2012c07**, **2012c08**, **2012c10** (now part of arXiv:1403.7404 [math.AG]), **2012c12**, **2012c15**, **2012c16** in the Trimester publications page; the same page will be kept up to date with publication history.

Apart from personal collaborations, the group activities included numerous informal seminars devoted to both basic and advanced topics in the physics and geometry of BPS states, as well as a colloquium style, monthly Trimester Seminar. In the course of the Trimester, Group D hosted numerous short-term visitors (a complete list can be found on the Trimester webpage), and ran two more formal mini-courses. Additionally we organised a workshop on the algebra, geometry and physics of BPS states (November 12-14, 2012), involving some 20 participants. Members of the Group also took part in an outreach initiative for the HIM; a podcast was produced and is available on the HIM Junior Trimester Program description page.

We feel very privileged to have had this opportunity to work at the HIM. The JHRT has been a very exciting, productive, and pleasant experience, which we believe will influence the research of the group members for many years to come.

Finally we like to mention that most members of Group D reconvened for the follow-up workshop “Donaldson-Thomas invariants, BPS states and related topics”, Pavia, 25 - 27 June 2013.