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Theta-functional approach to the theory of non-abelian monopoles

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Grantee: V.Z.Enolski (Kiev) Host: H.W.Braden (Edinburgh)

Purpose of visit Further work on the theta-functional approach to the integration of the Nahm equations that appears in the the ADMHN (Atiayh-Drinfeld-Hitchin-Manin-Nahm) construction. The first results in this direction were documented by the applicant and the host in [1]-[3].

Description of the work carried out during the visit During the visit to the University of Edinburgh the applicant was working on the explicit theta-functional construction of the solutions to the Nahm equation within the Hitchin theory of non-abelian monopole. The case of the charge three monopole was analyzed for the monopole the curve with Z_3 symmetry. The Hitchin constraints were in the focus of the attention. Whilst the first two constraints were explicitly resolved in the publication [2]-[3] of H.Braden (host) and the applicant, the third one, the most difficult for analytic investigation remained unresolved. That is the finding on intersection points of the theta-divisor with the given real segment. The definite success was achieved to resolve this constraint. To this end Fays results on the unramified covers were involved, what permitted to reduce the divisor description problem to vanishing of certain simple expressions built on theta-functions of elliptic curves.

The main result obtained Intersection of the theta-divisor with the real segment if found. The work confirmed conjectures concerning existence of the charge 3 monopole solution for certain class of monopole curve with Z_3 symmetry.

Future collaboration The work done by the applicant with H.Braden represent a part of bigger program outlined in [1] aimed to represent a comprehensive theta functional description of the solutions to the Bogomolny equation. Future collaboration of the applicant's Institute of Magnetism (Kiev) with H.Braden and his PhD students working in this area (Antonella D'Avanzo, Tim Northover) is planned.

Projected publications We are planning the following nearest publications

(i.) H.Braden, V.Enolski, *$SU(2)$-monopoles, curves with symmetries and heritage of Ramanujan,* Matem. Sbornik, submitted during the visit

H.Braden, D'Avanzo and V.Enolski, *Charge three cyclic monopole and Humbert varieties,* 2009, in preparation

(iii.) H.Braden, D'Avanzo and V.Enolski, *On the existence of higher charge monopole attached to unramified coverings,* 2009 in preparation

References

[1] Enolski, Victor and Braden, Harry. Finite-gap integration of the $SU(2)$ Bogomolny equations. *Glasgow Math. J.* 2008,**51** , Issue A, 25-41 arXiv: math-ph/0806.1807

[2] Braden H.W. and Enolski V.Z. Monopoles, Curves and Ramanujan, arXiv: math-ph/0704.3939.

[3] Braden H.W and Enolski V.Z., Remarks on the complex geometry of the 3-monopole, arXiv: math-ph/0601040, 2006.