Scientific Report for Phase II of the Project

1 Scientific results

The following lines give a short description of the research results obtained by the members of the team during the second phase of the project.

• In the paper *Symmetries of F-manifolds with eventual identities and special families of connections* (by *Liana David* and Ian Strachan; paper published in **Ann. Sc. Norm. Sup. Pisa**), we studied various properties of the duality for F-manifolds with eventual identities (developed by the same authors in a previous paper, published in **Adv Math** 2011). We considered the F-manifolds endowed with a class of connections (the so called "special connections"), which are torsion-free and compatible, in a certain way, with the multiplication of the F-manifold structure. The special connections on F-manifolds generalize the second structure connection of a Frobenius manifold. The properties of special connections and their behaviour under the duality of F-manifolds were studied. The results of the paper generalize the main features of Dubrovin's almost duality for Frobenius manifolds.

• In the paper *tt^*-geometry on the big phase space* (by *Liana David* and Ian Strachan; paper published in **Comm. Math. Physics**), we studied the tt^*-geometry of the so called big phase space M^∞, which is an infinite product of the small phase space M (which represents the main background for quantum cohomology). Using an approach suggested by the methods of Dijkgraaf and Witten, various structures were lifted from M to M^∞. We proved that the main notions from tt^*-geometry (e.g. CV-structures or CDV-structures) are preserved under such liftings.

• In the paper *On the classification of the real vector subspaces of a quaternionic vector space* (by *Radu Pantilie*, paper published in **Proc. Edinb. Math. Soc**) we developed the classification of the real vector subspaces of a quaternionic vector space by using a covariant functor which, to any pair

formed of a quaternionic vector space and a real subspace, associates a coherent sheaf over the sphere. It follows that, any pair whose corresponding coherent sheaf is without torsion is the product of (the pairs corresponding to) a CR quaternionic vector space and a co-CR quaternionic vector space.

2 Presentations as Invited Speakers

Monica Aprodu and **Gabriel Baditoiu** were *Invited Speakers* at *Workshop for Young Researchers in Mathematics*, Constanta (Romania), May 2013. **Radu Pantilie** was an invited speaker at *Aniversary Conference, Faculty of Science - 150 years*, University of Bucharest, September 2013.

3 Research stages abroad

Radu Pantilie visited *University La Sapienza* (Rome) for 15 days, in September 2013. The visit was partially supported by the budget of the grant.

4 Co-organization of a workshop

The director of the projet was a co-organizer of the worlshop *The 11th International Workshop on Differential Geometry and Its Applications*, Ploiesti, 19-22 September 2013. The budget of the grant (partially) supported the participation of Prof. Dmitri Alekseevsky from Masaryk University (Brno, Cech Republic) and Institute for Information and Transmission Problems (Moscow, Russia) and of Prof. Liviu Ornea from University of Bucharest. Various materials needed for the workshop (folders for participans etc) were also purchased using the budget of the grant.

5 Participation in seminars

The members of the team attended on a regular basis the differential geometry seminar from IMAR (the host institution of the project) where they presented the research results which they obtained on the topics of the project.