ANNEX A

PUBLIC SELECTION BASED ON QUALIFICATIONS AND INTERVIEW FOR THE AWARDING OF NO. 1 GRANT LASTING 12 MONTHS FOR CONDUCTING RESEARCH IN ACCORDANCE WITH ART. 22 OF LAW OF 30.12.2010 NO. 240 AT THE DEPARTMENT OF MANAGEMENT, INFORMATION AND PRODUCTION ENGINEERING OF THE UNIVERSITY OF BERGAMO (ACADEMIC RECRUITMENT FIELD 01/A4 – MATHEMATICAL PHYSICS - ACADEMIC DISCIPLINE MAT/07 – MATHEMATICAL PHYSICS, PROJECT "ANALISI DI FOURIER E SUE APPLICAZIONI", FUNDS 60BRAN15 E 60BRAN16.

announced with decree of the Rector Rep. no. 291/2017 of 19.05.2017 and posted on the official registry of the University on 19.05.2017

RESEARCH PROJECT

"Bi-Hamiltonian reduction and central invariants"

Research project

In the study of fluids one encounters several problems related to the presence of nonlinear phenomena as well as dispersive terms in the equations of motion. It is often used the long-wave approximation, which consists in ignoring the dispersive terms. The equations obtained in this case admit, in general, well-known bi-Hamiltonian structures, called "structures of hydrodynamic type", and closely related to geometric objects known as "Frobenius varieties".

First of all, the candidate will consider the study of the so called bi-Hamiltonian reductions. Indeed, many of the bi-Hamiltonian structures appearing in applications – whose description is tipically quite involved – can be obtained as suitable reductions of simpler structures defined on extended phase spaces. It is therefore useful to understand which properties of the non-reduced structure remain invariant when passing to the reduced structure. Important examples of these properties include the exactness of the bi-Hamiltonian structure and the description of the so called central invariants.

A second aspect of the project – of a more algebraic nature – deals with the description of the central invariants for the bi-Hamiltonian structures associated to dispersive deformations of Frobenius manifolds; the latter being ength y related to the long wave approximation of the fluid model. The first example to be considered will be the class of Frobenius manifolds associated to finite Coxeter groups, and the corresponding deformed structures related to bi-Hamiltonian structures of Drinfeld-Sokolov type. A purely algebraic proof will be provided for the Dubrovin-Liu-Zhang result, relating the central invariants to the ength of the simple roots of the Lie algebra associated to Drinfeld-Sokolov. This result will be generalized to extended affine Weyl groups.

General objectives of the project

To determine the properties of the dispersive system starting from the Forbenius manifold associated with the long-wave approximation; to study the class of systems associated with (finite and affine) Coxeter groups and with (simple and affine) Lie algebras.