

# SCIENTIFIC REPORT

AUGUST 2007

Concerning the visit of Spyridon Kamvissis (Greece) to Gerald Teschl, Vienna, Austria, August 2007

## 1. PURPOSE OF THE VISIT

The purpose of the visit has been collaboration concerning the asymptotic analysis of the long time behavior of a short range perturbation of the periodic Toda lattice. The leading order asymptotics having been analyzed in a recent paper (arXiv:0705.0346), we have now studied the higher order asymptotics coming from the stationary phase points of the exponential phase appearing in the associated Riemann-Hilbert problem.

## 2. DESCRIPTION OF THE WORK CARRIED OUT DURING THE VISIT

We have been able to discover how to capture the higher order asymptotics of the perturbed periodic Toda lattice (under a short range perturbation) by analyzing the localized Riemann-Hilbert problem with jumps across two small crosses centered on the two stationary phase points and by posing the correct ansatz for the solution of the problem as a product of two factors: one with no jump and living on the hyperelliptic curve, the other with (essentially) a constant jump and living on the complex plane.

## 3. DESCRIPTION OF THE MAIN RESULTS OBTAINED

We have shown that the higher order asymptotics in the analysis of the long time behavior of a short range perturbation of the periodic Toda lattice is of order

$t^{-1/2}$  and that the asymptotic formula is written in terms of the parabolic cylinder function.

#### 4. PROJECTED PUBLICATIONS/ARTICLES RESULTING FROM OUR GRANT

S.Kamvissis, G.Teschl, Stability of the Periodic Toda Lattice; Higher Order Asymptotics, in preparation.

#### 5. FUTURE COLLABORATION WITH HOST INSTITUTION

Soon we will be able to tackle the full generalized Toda shock problem in the most general case where the asymptotics of the initial data are of finite gap type, but with different genus, at  $-\infty$  and  $\infty$  respectively.

A further visit is planned for 2008.

Spyridon Kamvissis

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