

International Workshop on “Fundamental Problems in Mathematical and Theoretical Physics”

Date: July 16 – July 21, 2018

Venue: Large Conference Room, 1st Floor, 55N Bldg., Waseda University, Nishi-Waseda Campus
早稲田大学 西早稲田キャンパス 55 号館 N 棟 1 階 大会議室

Part II. Mathematical Physics

◆Rémi Carles (Montpellier University)◆

◆Mini Course I	July 18, Wednesday	14:45 - 16:15
◆Mini Course II	July 19, Thursday	16:00 - 17:30
◆Mini Course III	July 20, Friday	13:30 - 15:00

Universal dynamics for the logarithmic Schrödinger equation

We consider the nonlinear Schrödinger equation with a logarithmic nonlinearity, whose sign is such that no non-trivial stationary solution exists. Explicit computations show that in the case of Gaussian initial data, the presence of the nonlinearity affects the large time behavior of the solution, on at least three aspects. The dispersion is faster than usual by a logarithmic factor in time. The positive Sobolev norms of the solution grow logarithmically in time. Finally, after rescaling in space by the dispersion rate, the modulus of the solution converges to a universal Gaussian profile (whose variance is independent of the initial variance). In the case of general initial data, we show that these properties remain, up to weakening the third point (weak convergence instead of strong convergence).

In the first lecture, we present the model, some of its properties, and state the main results. In the second lecture, we analyze in details the Cauchy problem, and explicit computations in the Gaussian case. In the final lecture, we prove the main result. These lectures are based on a joint work with Isabelle Gallagher.

◆Marcello D'Abbicco (University of Bari)◆

◆Mini Course I	July 18, Wednesday	16:30 - 18:00
◆Mini Course II	July 19, Thursday	10:30 - 12:00
◆Mini Course III	July 20, Friday	10:30 - 12:00

Critical exponents for higher order dissipative evolution equations

In this course, we will show how to find the critical exponents of global small data solutions for some higher order evolution equations with a dissipative term and a power nonlinearity of type $|u|^p$ or $|u_t|^p$. In the first part of the course, we will investigate the case of σ -evolution equations (for instance, the plate equation and the beam equation are 2-evolution equations), showing how the diffusion phenomenon influences the critical exponent. In the second part of the course, we will show how to construct dissipative terms for a general higher order hyperbolic equation, possibly with multiple characteristic roots.

References

- [1] M. D'Abbicco, M.R. Ebert, *A new phenomenon in the critical exponent for structurally damped semi-linear evolution equations*, *Nonlinear Analysis* **149**, 2017, 1-40, <http://dx.doi.org/10.1016/j.na.2016.10.010>.
- [2] M. D'Abbicco, E. Jannelli, *Dissipative higher order equations*, *Communications in Partial Differential Equations*, 2017, <http://dx.doi.org/10.1080/03605302.2017.1390674>.