Research Activity: 1/4/2015 – 31/3/2016

List of Papers

1) Kazumasa Fujiwara, Shuji Machihara, and Tohru Ozawa,
Remark on a semirelativistic equation in the energy space,
Discrete Contin. Dyn. Syst., Dynamical systems, differential equations and applications. 10th AIMS Conference. Suppl., 2015, 473--478.

2) Kazumasa Fujiwara, Shuji Machihara, and Tohru Ozawa,
On a system of semirelativistic equations in the energy space,
Commun. Pure Appl. Anal., Vol.14, No.4, 2015, 1343--1355.

3) Kazumasa Fujiwara, Shuji Machihara, and Tohru Ozawa,
Well-posedness for the Cauchy problem a system of semirelativistic equations,
Comm. Math. Phys., Vol.338, No.1, 2015, 367--391.

4) Kazumasa Fujiwara,
Remark on local solvability of the Cauchy problem for semirelativistic equations,
J. Math. Anal. Appl., Vol.432, No.2, 2015, 744--748.

5) Kazumasa Fujiwara and Tohru Ozawa,
Remarks on global solutions to the Cauchy problem for semirelativistic equations with power type nonlinearity, Int. J. Math. Anal., Vol.9, No.53, 2015, 2599--2610.

6) Kazumasa Fujiwara and Tohru Ozawa,
Weighted Lp-boundedness of convolution type integral operators associated with bilinear estimates in the Sobolev spaces, J. Math. Soc. Japan, Vol.68, No.1, 2016, 169--191.

List of Talks

1) Title: “On the local existence of semirelativistic equations”
(半相対論的方程式の時間局所可解性に就いて),
MSJ Autumn Meeting 2015, at Kyoto Sangyo University, 15/9/2015.

2) Title: “Remark on local solvability of the Cauchy problem for semirelativistic equations,”

International Workshop on “Fundamental Problems in Mathematical and Theoretical Physics,” at Waseda University, 1/10/2015.

3) Title: “On the local existence of semirelativistic equations”
(半相対論的方程式の局所可解性について),
41th Evolution Equations and Applications, at Japan Woman’s University, 26/12/2015.

4) Title: “Nonexistence of local solutions for the Cauchy problem of semirelativistic equations,”
Workshop on Analysis in Kagurazaka 2016, at Tokyo University of Science, 23/1/2016.

5) Title: “Nonexistence of local solutions for the Cauchy problem of semirelativistic equations,”
The 22nd Machikaneyama Seminar on PDEs, at Osaka University, 18/2/2016.

6) Title: “The solvability of semirelativistic equations in subcritical case”
(半相対論的方程式の劣臨界尺度に於ける可解性),
23th SAMS symposium, at Yugawara, 29/2/2016.

Research Results：

１）I showed that there exists no time-local solution to the semirelativistic equations without gauge invariance for initial data with a singularity at the origin. In particular, I demonstrated the non-existence of solutions by a test function method. Especially, by special test functions which comes from a study of advection equations, the non-existence result is obtained even in a scaling subcritical case. As far as I know, it is the first study that the non-existence of solutions are argued in a scaling subcritical case.

２）We showed that the fractional Leibniz rule hold in a more general setting. We demonstrate that the correction terms come naturally from the Taylor expansion of the associated Fourier multiplier. This is a joint work with Professor Vladimir Georgiev at Pisa University and Professor Tohru Ozawa at Waseda University.

３）We showed the sharp condition of the total signed density of initial data for the finite time blow-up of solutions to the periodic nonlinear Schrödinger equations without gauge invariance. Moreover, we also obtain the estimates of the lifespan and blow-up rate of solutions for some initial data. In the earlier work, finite time blow-up of solutions is shown by reduction ad absurdum but we demonstrated the blow-up phenomena by using an ODE mechanism. This is a joint work with Professor Tohru Ozawa at Waseda

University.