Scientific Report

First name / Family name	Konstantina-Stavroula Giannopoulou
Nationality	Greek
Name of the *Host Organisation*	NTNU
First Name / family name of the *Scientific Coordinator*	Franz Luef
Period of the fellowship	01/03/2017 to 28/02/2018

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

The main research activity carried out during my ERCIM Alain Bensoussan Fellowship Programme is related to quantum mechanics in phase space and the semiclassical Wigner equation. Here we will focus in the work completed so far.

In this work, a close relationship between semiclassical analysis and Gabor frames has been investigated for the solutions of the Wigner equation on modulation spaces. In order to conduct this research we had to develop a novel approach to the Wigner equation based on the theory of pseudodifferential operators for modulation spaces.

We use the short time Fourier transform as a tool to transform the Wigner equation for the free particle in double phase space and we estimate its solution on modulation spaces using sharp integral bounds for Wigner distributions.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

- **Title:** An approximate series solution of the semiclassical Wigner equation
  Authors: K.S. Giannopoulou & G.N. Makrakis
  Abstract: We propose a new approximate series solution of the semiclassical Wigner equation by uniformization of WKB approximations of the Schrödinger eigenfunctions.
  Status: This work completed during the fellowship and a preprint can be found online at https://arxiv.org/pdf/1705.06754.pdf. The paper will be submitted for publication.

- **Title:** Estimates on modulation spaces for the Wigner equation
  Author: K.S. Giannopoulou
  Abstract: As in the title of the work, our efforts is in the investigation of a close relationship between semiclassical analysis and Gabor frames for the solution of the Wigner equation on modulation spaces.
  Status: The paper prepared during the fellowship and it will be submitted for publication.

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

Conferences
- Name: "Meeting of the Catalan, Spanish, Swedish Math Societies"
  Date: June 12-15, 2017
  Place: Department of Mathematics and Mathematical Statistics, Umeå University, Sweden
  (I gave a talk)

- Name: "Aspects of Time-Frequency Analysis"
  Date: June 5-7, 2017
  Place: Politecnico di Torino, Italy
  (I presented a poster)

Seminar talks
- January 30, 2018: NTNU, Luef's group, Trondheim, Norway
- March 6, 2017: NTNU, Analysis Seminar, Trondheim, Norway

Visit
- November 15-18, 2017: Research Training Group 1838, Spectral Theory and Dynamics of Quantum Systems, University of Stuttgart, Germany (talk)

As ERCIM fellow, I attended a weekly seminar on time-frequency analysis and frame theory organized by Prof. Franz Luef.

I also attended the PhD course with title "Numerical Methods of time-dependent differential equations" by Prof. Anne Kværnø, NTNU, Trondheim, Norway, which has enlarged my knowledge on numerical methods and it indicates some directions for future research.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

Name of the REP organisation: INRIA, Paris
Country: France
Research group: POEMS Research team, "Wave propagation: mathematical analysis and simulation"
Local scientific coordinator: Dr. Stéphanie Chaillat-Loseille, stephanie.chaillat@ensta-paristech.fr
Dates: February 11-16, 2018
Experience: During my visit at INRIA, I gave a presentation of my research work on the semiclassical Wigner equation and I had the opportunity to exchange ideas with the researchers of the group, Drs. Laure Pesudo, Marc Lenoir and Félix Kpadonou, about potential research collaborations.

I also gathered information on relevant projects that Poems team is working on, attending a seminar talk on "Asymptotics Methods (HF)" by Dr. Daniel Bouche (CEA, France), and expanded my knowledge on research and development activities from a non-academic perspective.