POSTDOC POSITION IN MATHEMATICAL PHYSICS IN BESANCON

Institution. Laboratoire de mathématiques de Besançon, Université de Bourgogne Franche-Comté, France.

Contacts. Nabile Boussaïd, Thierry Daudé and Geneviève Dusson.

Position type. 12 or 18 months Post-Doctoral position.

Starting and ending date. Between July 2021 and January 2022 up to December 2022, upon mutual agreement.

Teaching. No teaching duties are imposed to the successful candidate.

Postdoc's research project. Black holes quasinormal modes (QNM) or resonances are a fundamental notion playing a key role in the detection of gravitational waves in the LIGO and VIRGO projects. Using a recently proposed hyperboloidal foliation approach due to Warnick[1], QNM can be viewed as mere eigenvalues of non-selfadjoint Schrödinger-like operators depending on the geometry of the black holes and on the particular hyperboloidal foliation. Numerical results due to Jaramillo *et al.*[2] indicate that QNM are unstable under small perturbations. Moreover, this instability phenomenon is confirmed by the numerical analysis of the pseudo-spectrum. The research project of this postdoc will consist in understanding both theoretically and numerically this observation and its universality (that is whether it depends on the geometry and/or the chosen hyperboloidal foliation). The foreseen research directions would be:

- analysing the inverse resonances problem, that is the problem of determining the geometry of the black hole from the knowledge of its QNM,

- providing a certified numerical scheme to compute the first QNM and overtones.

Profile of the candidates. Applicants must have obtained a Ph.D. or equivalent degree before starting the postdoc position. The successful applicant must have strong background in one or several of the following topics: **Spectral theory of non-selfadjoint operators, General Relativity, Black Holes, Scattering resonances, Semiclassical analysis, Inverse spectral problems**. The applicants should moreover possess skills in **Numerical analysis**. Applications at the crossroads of several of these topics will be most appreciated. She/He will have facilities to travel and she/he will interact with the members of the research project (Nabile Boussaïd, Thierry Daudé, Geneviève Dusson and Jose-Luis Jaramillo).

Applications. The applications should contain:
   (1) a detailed CV with a description of the past research,
   (2) 2 letters of recommendation (to be sent separately),
and should be sent by the applicant to **thierry.daude@univ-fcomte.fr** before April 30, 2021.

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[1] On quasinormal modes of asymptotically anti-de Sitter black holes, CMP, 333 (2015), no. 2, 959-1035

[2] Pseudospectrum and black hole quasi-normal mode (in)stability, preprint (2020), arXiv:2004.06434