<u>Statement on "Soutenance d'une Habilitation à diriger des recherches (HDR)" concerning Dr.</u> <u>Serge Franchoo</u>

I have been charged with the task of assessing the habilitation dissertation written by Dr. Serge Franchoo entitled *Evolution de la structure nucléaire: De semi-magicité à magicité dans les isotopes de cuivre riches en neutrons*. Dr. Franchoo has been pursuing his research on contemporary nuclear structure questions, predominantly through the utilisation of radioactive beam facilities.

The HDR dissertation covers in depth the structure evolution in neutron-rich copper isotopes starting with a broad background in the nuclear shell model and an historical exposé of how knowledge in this region of the Segré chart gradually has been built up. The author then makes a detailed review of the experimental knowledge in neutron-rich copper isotopes with focus on the evolution of the ground state and low-spin levels. The dissertation treats this in a holistic manner, with mentions of a multitude of key experiments and the associated theory efforts. Chapter 3 takes the overview of the theory efforts further, yielding an comprehensive picture of those.

The following chapters 4 and 5 are focussed on experiments performed within the realm of two PhD student projects supervised by Dr. Franchoo, performed at GANIL and RIBF respectively, and supported by published works. The chapters do introduce the experiments in a comprehensive manner that puts the published work into context. The concluding bibliography is very exhaustive.

The HDR dissertation is very well written and demonstrates that the author has an excellent overview of nuclear physics in general and this specific topic in particular. The text conveys well the progress of the research of interest, with many details that highlight the scientific process, its often-non-linear evolution and the actual scientists pushing it forward. As a side remark, the language is on an unusually high and varied level of for a scientific publication, and the narrative aids in keeping the reader's attention. The included publications are of very high scientific quality, demonstrated by the periodicals having accepted them, in particular Physics Letters B and Physical Review Letters. It should as well be noted that the experimental programme has been performed at two of the world-leading facilities for radioactive beam physics, GANIL in France and RIBF at RIKEN, Japan. In particular the latter case, the competition for beam time is fierce, and the selection of approved experiments is done with the highest international scientific standards. The only minor shortcoming of the dissertation is the omission of a concluding/outlook chapter that would have been a most interesting read.

My assessment is that Dr. Franchoo demonstrates a deep knowledge of the particular topic and as well nuclear physics at large. The research performed is by nature bound to be a collaborative

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effort, but the dissertation shows his standing and strong personal contribution to the field. This is further corroborated by the published research papers in high-profile journals, where his PhD students appear as first authors and Dr. Franchoo as second, having made a definite impact in the field. I remain very impressed by the quality and width of his efforts and how it is presented in the HDR dissertation. I would strongly recommend proceeding with the habilitation defence for Dr. Serge Franchoo.

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