Preface

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This special issue ‘PHDIA FUSION 2019: SYNTHETIC DIAGNOSTICS FOR INFERRING PLASMA PROPERTIES’ contains selected invited papers presented at the occasion of the PhDia Summer School that I had the pleasure of preparing and chairing as Director of the School in collaboration with the Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN), who did a great job in the organisation of the event.

The PhDiaFusion 2019 Summer School is a biannual scientific event, mainly focussed on a particular subject of prime interest for the fusion plasma community. The School is addressed to undergraduate, graduate and PhD students with their tutors. It is held in a spirit of “master and apprentice” approach. Lectures supported by hands-on tutorials are given by eminent world-class experts in the field of plasma physics. PhD students have an opportunity to present their recent work and achievements. The best students’ contributions are awarded.

In 2019 the 3rd edition of the PhDiaFusion Summer School took place in the beautiful surrounding of the Royal Castle in Niepołomice, Poland on June 3–7, 2019. This edition of the school was focused on ‘synthetic diagnostics for plasma physics’, including application to magnetic and inertial confinement. The idea is indeed to cross-fertilize the different fields of application and benefit from the expertise of various community. This is also a great opportunity for the speakers to exchange ideas in mini-workshop environment, and I should emphasize that this particular edition was greatly fruitful in that sense.

The development of synthetic diagnostics is an extremely important topic in fusion research. By full numerical simulation of the detection process, synthetic diagnostics are the crucial element at the frontier between modelling and experiments. They allow researchers to infer the

expected measurements from a given plasma scenario and to validate or reject the candidate models by comparison of their predictions with experimental data. Moreover, synthetic diagnostics are an essential tool for design optimization of the plasma diagnostics in their conceptual phase, for example to prepare the set of detectors for ITER (the International thermonuclear Experimental Reactor, a joint venture between Europe, Japan, Russia, USA, China, India and South Korea) but also DEMO, the next step fusion reactor that will deliver electrical power from fusion to the population.

PhDiaFusion 2019 has been officially recognized as one of the events of the French-Polish Scientific year. We had a great honor to host Dr. Christophe Paoli, Attaché for Scientific and Academic Cooperation of the French Embassy in Poland. During the event, Dr. Paoli gave a presentation underlining the importance of the existing Polish-French collaboration and presenting the main tools for further cooperation.

The selected invited papers consist of original research and overviews. They have gone through a rigorous reviewing process as required by JOFE and I hope that the readers will appreciate the quality of their papers.

To conclude, I would like to thank very much the French Embassy for their kind support and all the organizing Team from IFJ-Pan, in particular Prof. Marek Scholz, Dr. Jakub Bielecki, Dr. Agnieszka Kulińska who really helped me make this event a success.

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