Name of contact person: Raul Sanchez Phone: +34 916246001 Fax: +34 916248749 e-mail: raul.sanchez@uc3m.es		Institution: Universidad Carlos III Complete address: Av. De la Universidad, 30, 28911 Leganés, SPAIN				
Relevant field (choose from list below)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**

F1. Tokamak physics for ITER and beyond
F2. Technology for ITER and beyond
F3. Stellarator and reversed field pinch research and advanced concepts
F4. Plasma-wall interaction and material research
F5. Plasma theory and computational plasma physics
F6. Diagnostics, plasma control and data analysis

Thesis Topic (fitting within at least one of the research fields): Investigations on the nature of radial turbulent transport in flux-driven gyro-kinetic simulations with the GYSELA code

Background: Understanding the nature of turbulence and the appropriate way to model turbulent transport is extremely important in magnetic fusion and, in particular, for ITER. Gyro-kinetic codes have been developed in the last decades to address this problem. GYSELA is a state-of-the-art gyro-kinetic code that evolves the 5D gyro-averaged, full ion distribution function coupled to the Poisson equation using a semi-Lagrangian approach. It implements flux-driven boundary conditions, which allows for the free evolution of plasma profiles. This is in contrast to the majority of gyro-kinetic codes, which typically employ instead fixed-gradient boundary conditions. Therefore, GYSELA provides an excellent test-bed to test recent predictions regarding dramatic changes in the nature of radial transport that should appear in near-marginal turbulence conditions and/or in the presence of zonal flows.

Objective: The main objective of the thesis would be to characterize any changes in the nature of radial turbulent transport that could take in near-marginal conditions and/or in the presence of zonal flows excited by turbulence itself. To do so, several GYSELA simulations will be carried out in different regimes of interest. Then, several tools imported from the theory of non-Gaussian, non-Markovian stochastic systems will be employed to look for these changes, understand their origin and examine its implications for magnetic fusion confinement.

Time line and mobility scheme (see guidelines summary, research need to be performed for at least six month in two different countries):

First year:
Universidad Carlos III de Madrid, Spain (nine months)
CEA-Cadarache (three months)

Second year:
Universidad Carlos III de Madrid, Spain (nine months)
CEA-Cadarache (three months)

Third year:
Universidad Carlos III de Madrid, Spain (nine months)
CEA-Cadarache (three months)

Home Institution (must be full partner):

Universidad Carlos III de Madrid

Responsible person(s) at the home institution
(indicate full contact data of promoter and/or mentor):

Prof. Raul Sanchez, Departamento de Física. Full Physics Professor.
e-mail: raul.sanchez@uc3m.es. Phone: +34 916246001

if the Home Institution is not a University indicate the
University* at which the promoter is affiliated

Second institution (in a different country, can also be associated partner):

Association Euratom-CEA, CEA/DSM/IRFM
Centre de Cadarache, 13108 St-Paul-Lez-Durance, France

Responsible person(s) at this second institution
(indicate full contact data of co-promoter and/or co-mentor):

Dr. Y. Sarazin,
Research Scientist at Association Euratom-CEA, Cadarache
Tel.: ++33 0442254803Fax: ++33 0442256233 e-mail: yannick.Sarazin@cea.fr

if this second institution is not a University indicate the
University* at which the co-promoter is affiliated

Aix-Marseille Université (AMU), France

*** note:** if these universities are not both full partner (in which case they have already agreed to provide at least a double degree), both universities have to submit with the submission of the common thesis topic, a letter confirming that they will award at least a double degree.

Other Partners:

David Newman, University of Alaska, Fairbanks, USA

Remarks:

Annex 1 - Structure of the FUSION-DC network

FUSION-DC full partners

Universiteit Gent (Coordinating institution), Belgium
Université Henri Poincaré, Nancy I, France
Universidad Complutense de Madrid, Spain
Universidad Carlos III de Madrid, Spain
Universität Stuttgart, Germany
Università degli Studi di Padova, Italy
Instituto Superior Técnico, Lisbon, Portugal

Institut de Recherche sur la Fusion par confinement magnétique, Saint-Paul-les-Durance, France
Max-Planck Institut für Plasmaphysik, Garching and Greifswald, Germany

FUSION-DC associated members

CIEMAT, Madrid, Spain
FOM, Nieuwegein, the Netherlands
Forschungzentrum Jülich, Germany
ITER Organization, Saint-Paul-les-Durance, France
Fusion for Energy, Barcelona, Spain
IPP Prague, Czech Republic
Université de Provence Aix-Marseille I, France
Technische Universiteit Eindhoven, the Netherlands
Université Libre de Belgique, Brussels, Belgium
Ludwig Maximillian University, Munich, Germany
FUSENET Association, Eindhoven, the Netherlands

University of California Los Angeles, USA
University of California San Diego, USA
University of Wisconsin-Madison, USA

St. Petersburg State Polytechnic University, Russian Federation
MEPhI, Moscow, Russian Federation

Tsinghua University, Beijing, China
Southwestern Institute of Physics, Chengdu, China
University of Science and Technology of China, Hefei, China

Kyushu University, Kasuga-city, Japan