PhD Programme	**FUSION SCIENCE AND ENGINEERING**
Curriculum *(if foreseen)*	
Type of scholarship	Ex DM 630/2024
Project title	Implementing Machine Learning for Sustainable Improvement in Aluminium Alloys Production: A Pathway to Efficiency, Quality, and Environmental Responsibility
Supervisor	Manuele Dabalà
Supervisor Email	manuele.dabala@unipd.it
Project description	The project aims to enhance aluminium alloy production in Europe, addressing environmental and technical challenges by enhancing sustainability. Utilizing secondary aluminium, which uses 70% less energy and reduces carbon emissions compared to primary aluminium, is key. Conventional methods for assessing aluminium quality are time-consuming and inefficient. The PhD project proposes an innovative analytical system that rapidly identifies and analyses melt quality using non-equilibrium thermodynamics and machine/deep learning algorithms. This system enables real-time adjustments to melt composition, improving product quality and reducing defects. Implementing Machine and deep learning algorithms will significantly improve aluminium melt quality assessment. Moreover, the project promotes Open Science principles, encouraging collaboration with academic institutions, and industry partners. It aims to share research findings and engage with the scientific community via conferences.
Mandatory traineeship	6
Financing or co-financing party	DUEDI S.r.l.

PhD Programme	**FUSION SCIENCE AND ENGINEERING**
Curriculum *(if foreseen)*	
Type of scholarship	Ex DM 630/2024
Project title	Non linear MHD Physics and correlations with 3D fields in view of DTT
Supervisor	Lidia Piron
Supervisor Email	lidia.piron@unipd.it
Project description	The proposal aims at developing modeling expertise concerning the non-linear interaction between magnetically confined plasmas and 3D external fields. Present devices often use such fields (usually labelled as Resonant Magnetic Perturbations) for a variety of applications, such as controlling Edge Localized Modes. The work will complement and advance present lines of research dedicated to understanding ELM control physics on present day devices and make projections for DTT. In particular non-linear modeling will be used to study the physics of ELMs mitigation and suppression by RMPs, calculating divertor heat fluxes due to RMPs and consequently optimizing the applied fields. Two of the most well-known tools available to the community will be applied in this project, namely the linear resistive MHD code MARS-F and the non-linear MHD code JOREK. An established collaboration with the Max Planck Institute for Plasma Physics (Garching, DE) will be exploited for training and to plan the foreseen mobility during the PhD period, as well as other collaborations within the EUROfusion framework.
Mandatory traineeship	6
Financing or co-financing party	Consorzio RFX

PhD Programme	**FUSION SCIENCE AND ENGINEERING**
Curriculum *(if foreseen)*	
Type of scholarship	Scholarship funded by external public or private bodies/Departments
Project title	Study of high radiative power exhaust scenarios
Supervisor	Paolo Innocente
Supervisor Email	paolo.innocente@igi.cnr.it
Project description	The aim of the activity is to model the plasma edge and plasma divertor interaction in present high radiative experiments with specific interest in the no ELM or small ELM scenarios which are most relevant for DTT (the Divertor Test Tokamak facility in construction in Italy) and future fusion reactors. This will be done on seeded high-power pulses recently done at JET tokamak and at the WEST experiment that allows long-pulse operation to be handled in an all-tungsten device such as DTT. At the same time, power exhaust modelling of seeded plasma will be carried out on all divertor configurations of the DTT. Edge modelling will be performed with the SOLEDGE3X code which has been validated in the present experiments against experimental data and on future ITER tokamak compared to SOLPS-ITER. The activity will be carried out in close collaboration with the edge group of the CEA laboratory in France which developed the code.
Mandatory traineeship	n.a.
Financing or co-financing party	Consorzio RFX

PhD Programme	**FUSION SCIENCE AND ENGINEERING**
Curriculum ***(if foreseen)***	
Type of scholarship	Scholarship funded by external public or private bodies/Departments
Project title	Integration, characterization, optimization of the Non-Evaporable Getter technology in large vacuum systems for fusion applications: the case of SPIDER beam source
Supervisor	Emanuele Sartori
Supervisor Email	emanuele.sartori@unipd.it
Project description	In Padova at the Neutral Beam Test Facility, the prototype neutral beam injectors for ITER are being developed. Huge vacuum systems have a key role for the success of these large experiments. In the next years, a very large one-of-a-kind Non-Evaporable Getter pump will be installed in the prototype beam source SPIDER. This research project is integrated in the research activities necessary for its characterization and optimal use. The project includes modelling and experimental tests of: gas flow in molecular regime, gas-getter material interaction, thermal and mechanical aspects of the design, integration and operation of the beam source, also in comparison with other large pumping systems. The PhD project is fully integrated in the effort of the fusion community towards the start of ITER, in a joint collaboration with an innovative Italian company, offering the opportunity to work in exciting international environment as well as in industrial context devoted to research & development.
Mandatory traineeship	n.a.
Financing or co-financing party	SAES Getters S.p.A.