

The role of the University in IFMIF-DONES

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Development of research lines related to IFMIF-DONES

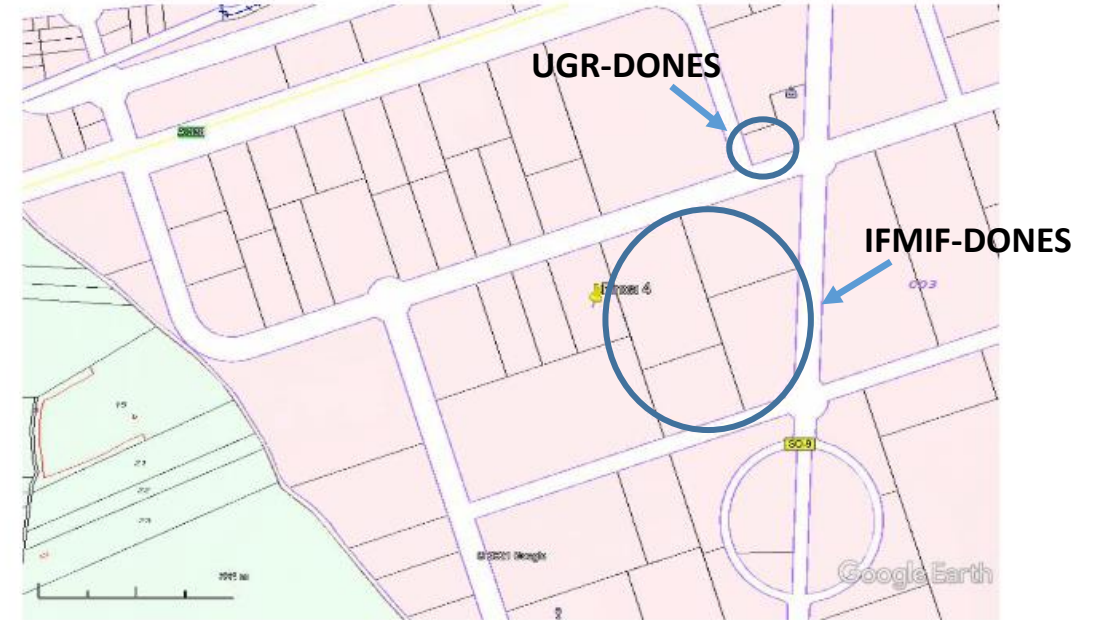
Pre-doctoral contracts UGR-CIEMAT - IFMIF-DONES - Active Research Lines

- Characterisation of the materials (getters) to be used in the impurity traps.
- Development of a beam diagnosis based on radiofrequency receivers to control the beam profile on the target.
- Development of an expert system for predictive maintenance in IFMIF-DONES and intelligent estimation of spare parts.
- Design of a radiology laboratory taking into account the singularity of the DONES facility.
- Study of the hydrological parameters of different types of sustainable drainage systems (SuDS) that can be applied in Mediterranean environments.
- Study of the different families of precursor interstitial clusters formed in irradiated Fe by means of ab initio calculations.

Pre-doctoral contracts UGR-CIEMAT - IFMIF-DONES - Active Research Lines

- Modelling of the STUMM (Start-up and Monitoring Module) sensors.
- Simulation of eventual air or water ingress into the accelerator cavity, and of abrupt rupture of the target vacuum chamber seal.
- Deep learning by reinforcement for generative design of safety features in IFMIFDONES.
- Establishment of the biological effect of neutrons on tumour models in vitro.
- Neutron-thermal modelling of an irradiation for detailed sample-by-sample dose estimation from available detector data.
- Production of isotopes in DONES: exhaustive analysis of different isotopes and preliminary design of their industrial production.

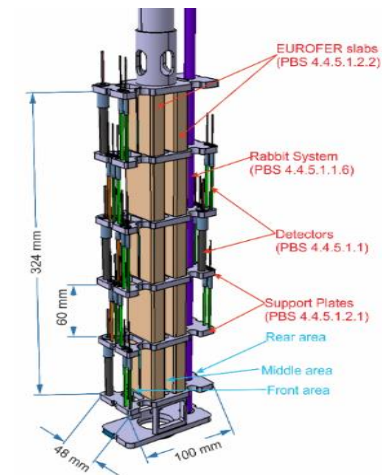
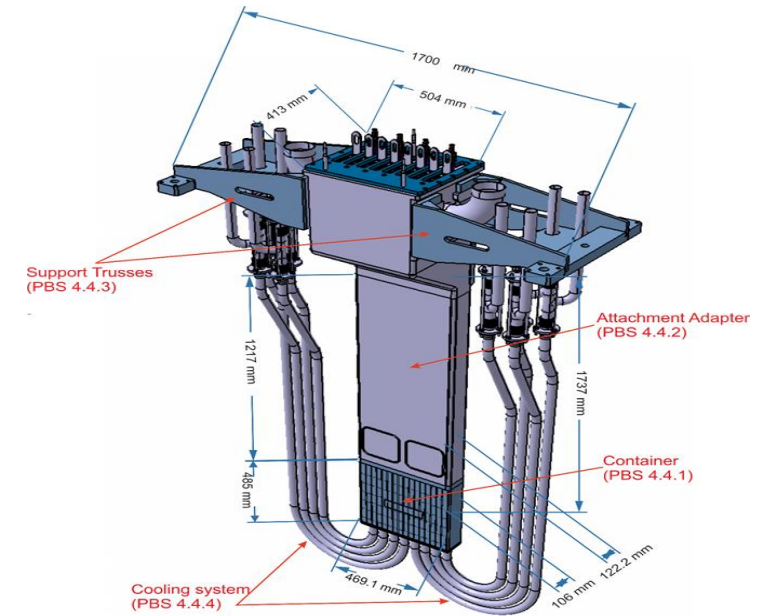
UGR-DONES – Research Center



Development of DONES component prototypes

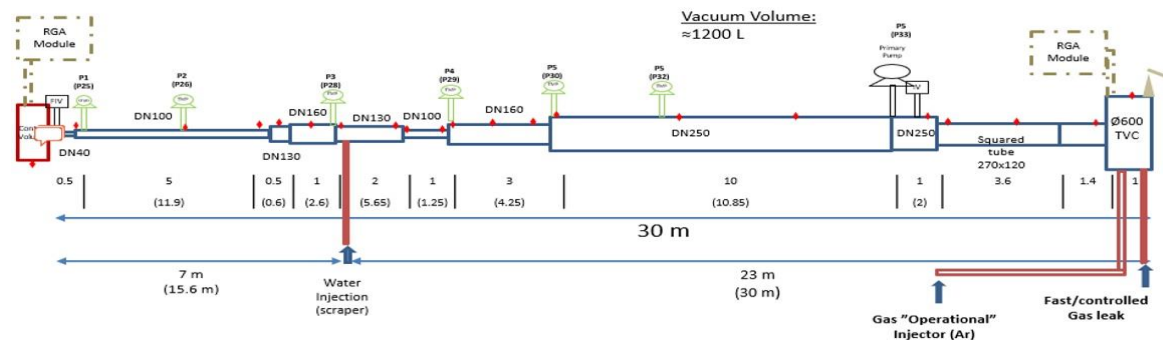
STUMM (STart-Up Monitoring Module)

The STUMM shall be located in the Test Cell, just behind the Lithium target (Backplate). At the location of the HFTM. It is intended to check the radiation conditions in the High Flux area. The prototype will be used to gain knowledge about the instrumentation and measuring devices available in the prototype. In addition, we will see the thermo-mechanical behaviour of the element, cooling system...



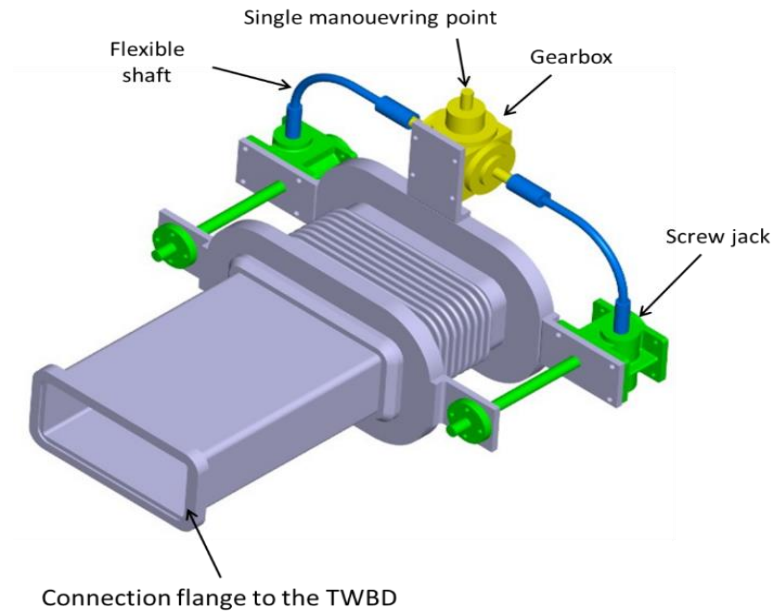
MUVACAS (MULTIpurpose VACuum Accidental Scenarios)

The aim of MuVaCas prototype is to replicate different scenarios to determine what happens when certain "unforeseen" but "not impossible" circumstances occur in the HEBT line: Vacuum Break, Water Ingress, Air Ingress, Helium, Argon...



QDS (Quick Disconnecting System)

The QDS is a system for joining different sections of the duct through which the beam circulates, which will allow it to be assembled and disassembled remotely.



Research Laboratories

Virtual reAlity Lab for sciEntific and industRIal fAcilities (VALERIA lab)

The lab is part of the **Computer Architecture and Technology Department at University of Granada**. Led by Assoc. Prof. Jesús Garrido and Prof. Eduardo Ros.

The group develops and uses **virtual reality** environments to gain understanding on the future application of industrial and engineering processes.

Created in 2019 to participate in the virtual reality simulation of the tasks for the maintenance of the IFMIF-DONES, an international fusion materials irradiation facility.

The group integrates experts in high-performance simulation, robotic systems, virtual reality and immersive technologies to produce beyond-state-of-the-art simulations of engineering processes since the earliest stages of design until the plant operation.



Inmersive display (HMD)

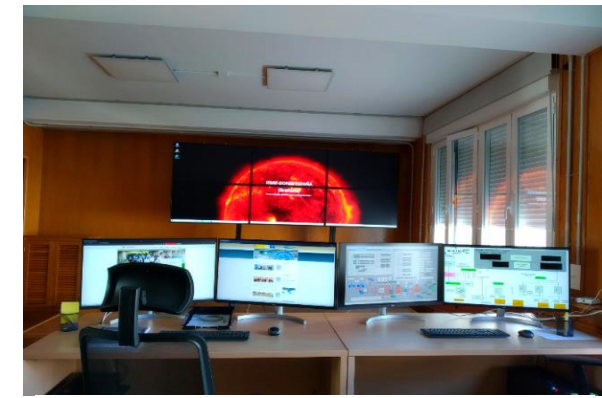


Level 1 maintenance task simulation

IFMIF-DONES Control Lab

Research about key **control technologies** for the design and construction of the IFMIF-DONES facility.

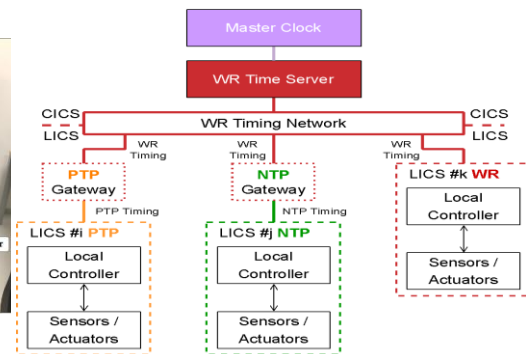
Main topics: control system requirements and use cases, remote handling robotics and automation, timing and communication, CICS & LICS control architectures, Digital Twin (virtual infrastructure)



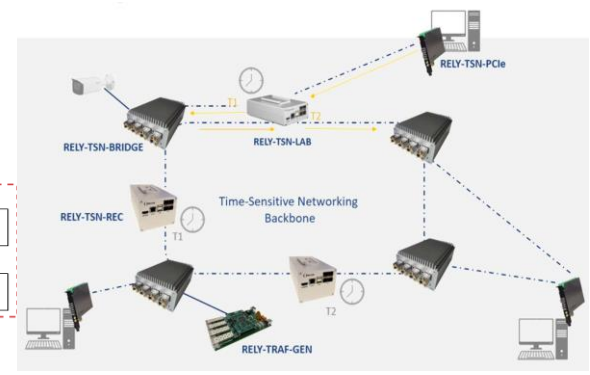
Videowall – Mirror Room



Remote handling area



Timing and Communication architecture exploration and setups



Mechatronics Unit

Technological support to the project through the manufacture of mechatronic devices:

- Design and CAD/CAM modelling of engineering parts.
- Prototyping and manufacture of scientific instruments and devices.
- Three-dimensional printing of functional engineering models.
- Machining: milling, cutting, engraving, threading, drilling and turning.
- Ultrasonic cleaning of engineering parts or electronic circuits.

This unit will support the main facility as well as the clean room and the laboratories for micro- and macro-characterisation of structural materials and the assembly of prototypes and functional experiments planned for the IFMIF-DONES - UGR Research Centre.

Training Programmes

Research, Training and Mobility Programme - IFMIF-DONES

LIPAc site - QST Rokkasho Fusion Institute (Rokkasho, Japan) - 4 positions

- Accelerator Physicist
- Beam Operation Engineer
- Electrical_Mechanical Engineering
- Accelerator Control System

KIT (Karlsruhe, Germany) – 1 position

- Neutronics for DONES

ENEA (Brasimone, Italy) – 1 position

- DONES Remote Handling

ENEA (Frascati, Italy) – 1 position

- RAMI studies for DONES

DONES Xcitech - School on Science and Technology

DONES Xcitech is a science and technology school of the University of Granada (Spain), focused on Big Science Technologies and supported by the IFMIF-DONES España consortium. The school aims to address along the years topics related to IFMIF-DONES science and technologies, such as fusion devices, neutron sources, accelerators technologies but will also offer more general courses on materials science, nuclear physics or medical applications.

DONES Xcitech aspires to become a reference for training and education in the technologies needed for Big Science, an incubator of highly qualified professionals, and a meeting point between academia and industry.

The first **DONES Xcitech** will take place from April 23rd to 28th, 2023.



Organization Staff:

Director of the School: Dr. John Wommersley

Co-Director of the School: Dr. Blanca Biel

Director of course on "IFMIF-DONES in depth": Dr. Moisés Weber

Director of course "Radiation Effects on Fusion Structural Materials: Dr. Eberhard Diegele

University of Granada Executive Bureau: Miguel Ángel Guardia / José Antonio Carrillo

THANKS!