# Update on IFMIF-DONES


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**Próximas oportunidades para el sector industrial en IFMIF-DONES**
**video, 18 Mayo 2021**

DONES Preparatory Phase

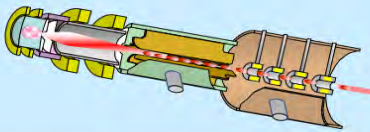
# What is IFMIF-DONES?



**A fusion-like neutron source required for the qualification of the materials to be used in the EU DEMO**

## Accelerator

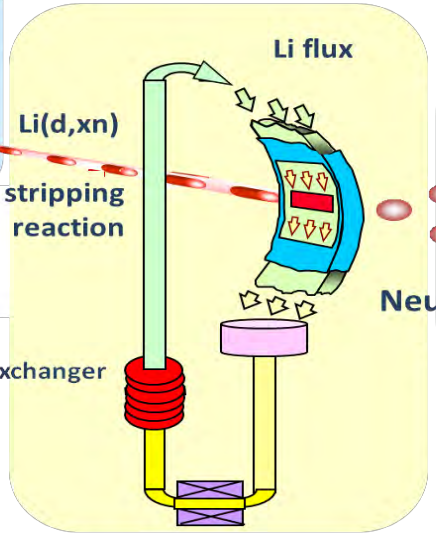
Deuterons: 40 MeV 125 mA (5 MW)



**Deuterons at 40 MeV collide on a liquid Li screen flowing at 15 m/s**

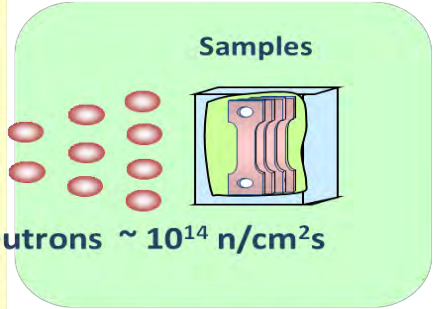
A neutron flux of ~ $10^{14}$ $cm^{-2}s^{-1}$ is generated with neutron spectrum up to 50 MeV energy

## Lithium Loop (Target)




Heat removal by high velocity Li flux

## Test (Irradiation) Module




**High Flux Test Module:**

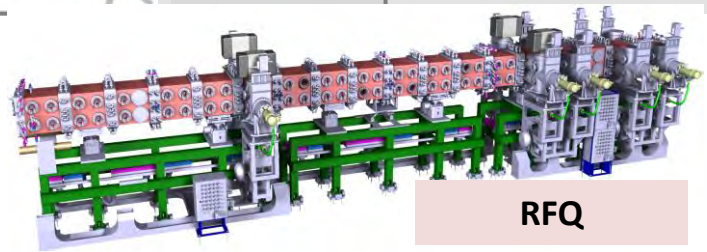
20-50 dpa/y at 100 $cm^3$

Controlled temperature:

250 < T < 550 ºC

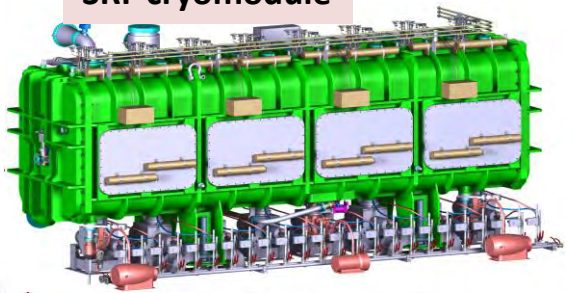
# Accelerator systems summary





RFQ

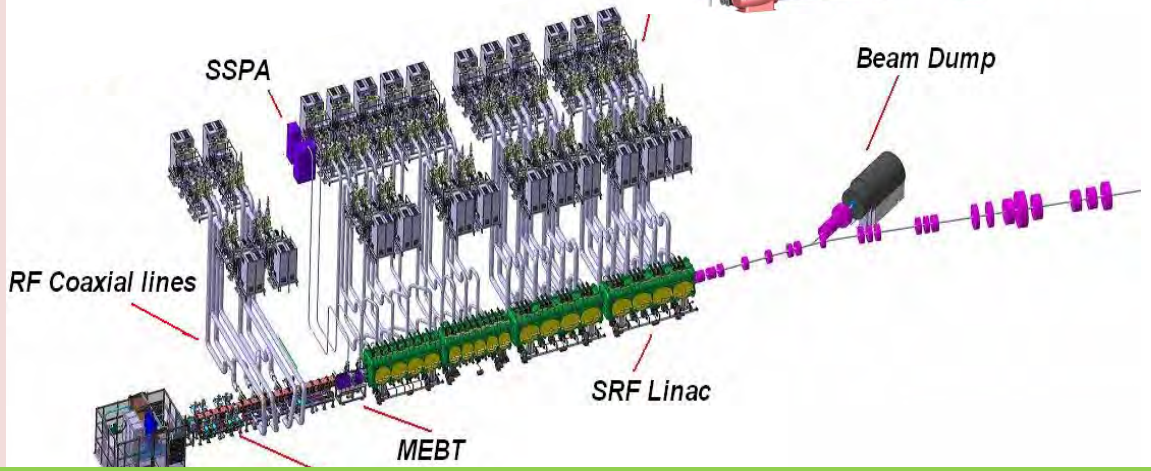
SRF cryomodule



- Waiting for validation results from IFMIF-EVEDA: LIPAc Prototype (Rokkasho)

Main involved technologies

- RF
- Cavities
- Magnets
- Mecatronics (Cu, Nb, Al,…)
- Criogenics
- Vacuum
- Power supplies
- Cooling technologies
- Diagnostics
- Control (hardaware and sofware)



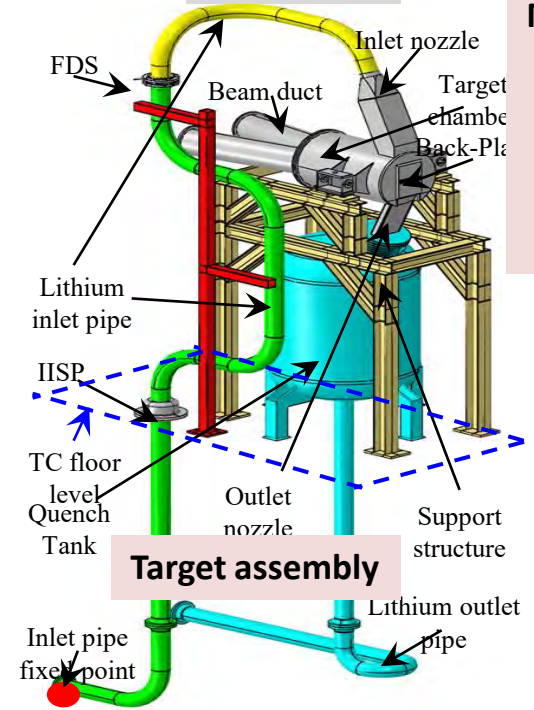

- **175 MHz, 5MW, 125 mA, CW, high availability: One of the more powerful accelerators in the world**

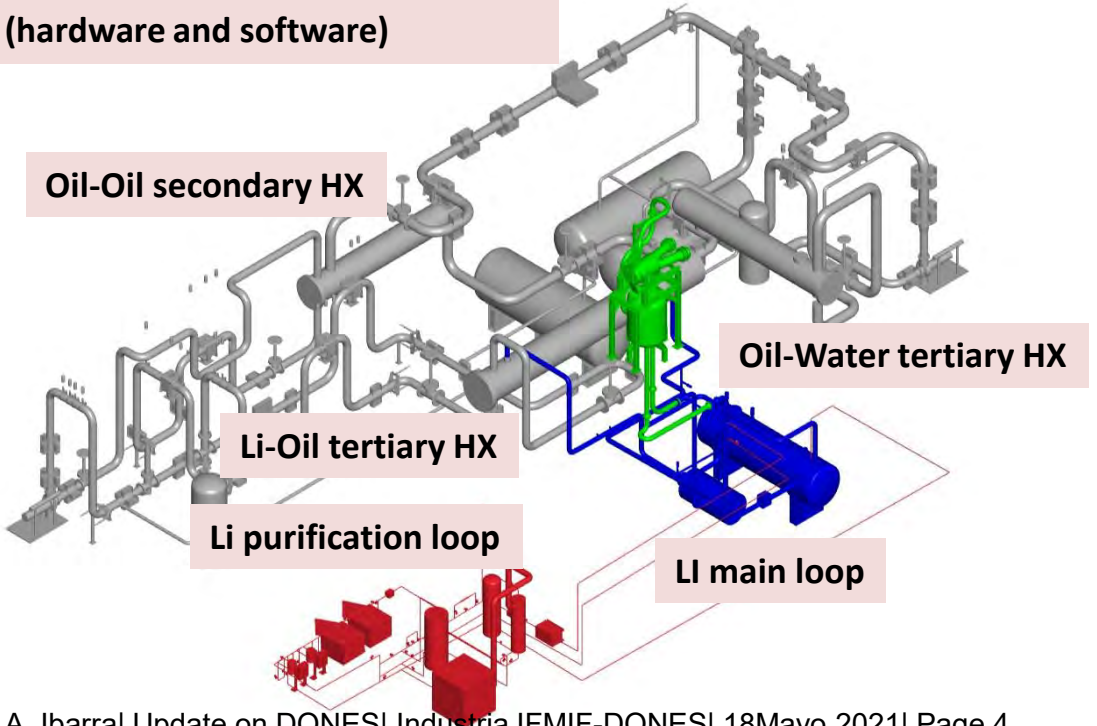
# Li systems summary



**Main involved technologies**

- Liquid metals (fluids, monitoring and purification)
- Complex cooling loops
- Diagnostics
- Remote maintenance
- Control (hardware and software)

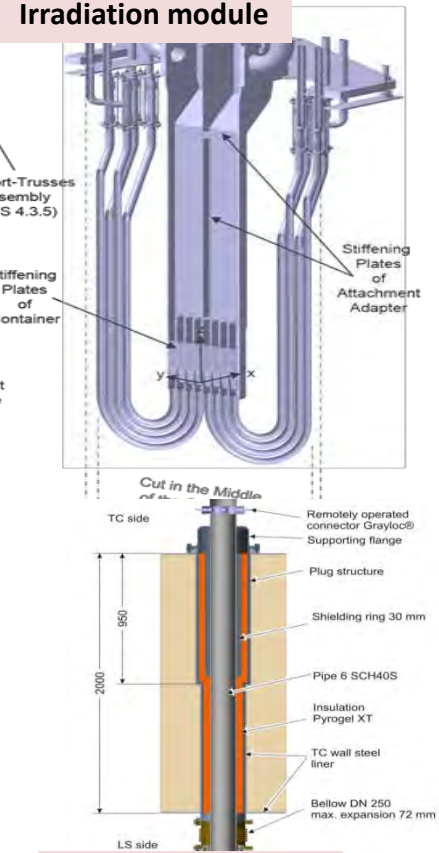


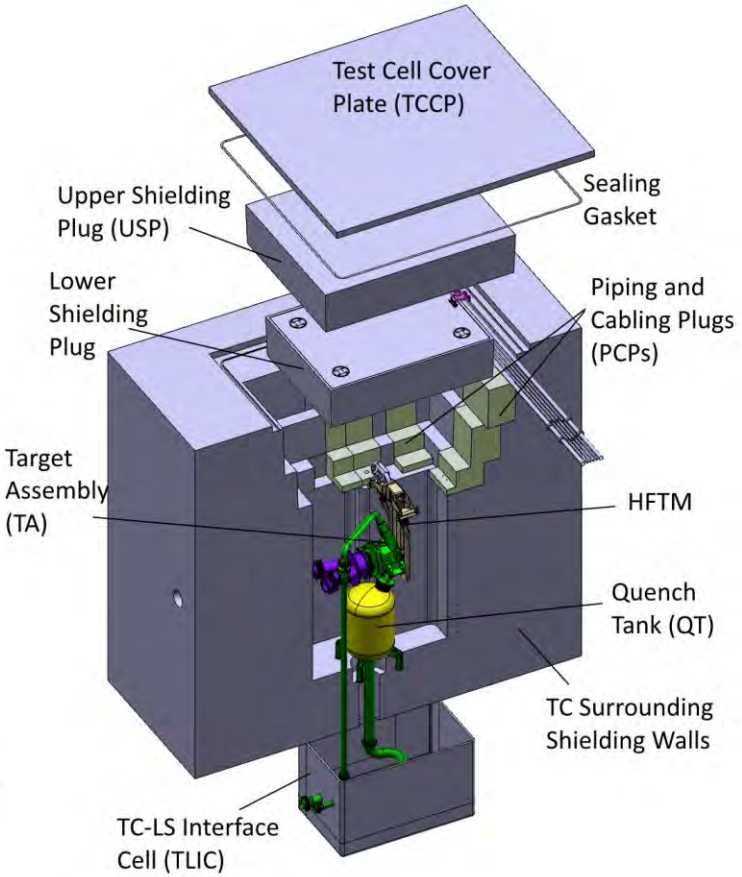
# Test Systems summary



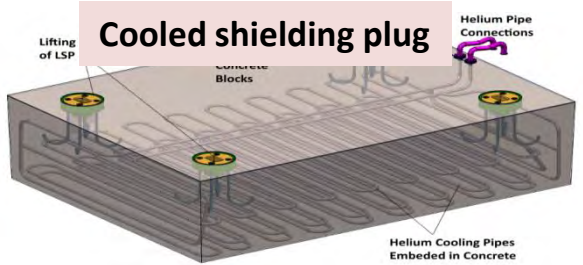
## Irradiation module




## Duct penetration




## Cooled shielding plug

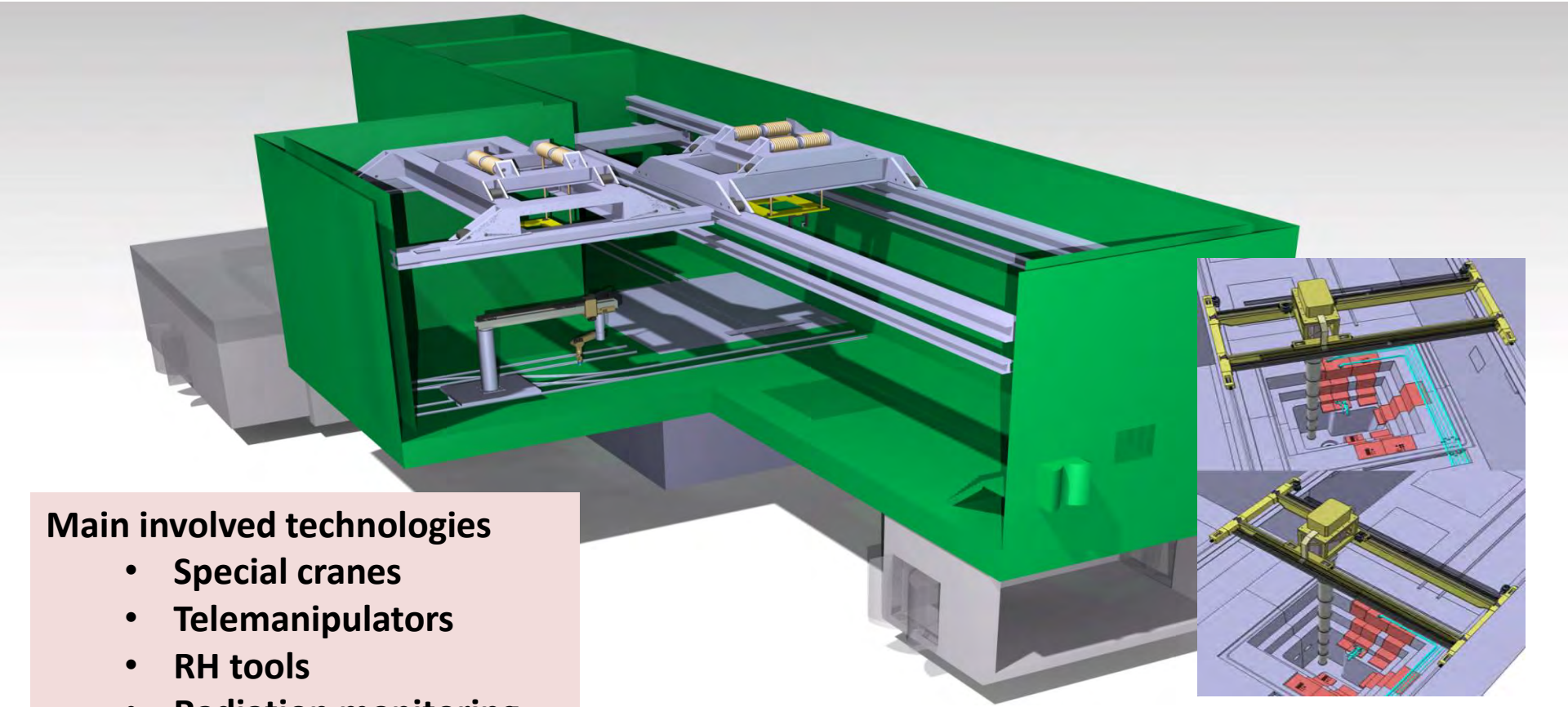



## Main involved technologies

- Mecatronics
- He and water cooling
- He, Ar and water systems
- Shielding materials and technologies
- Remote maintenance
- Vacuum
- Diagnostics
- Control (hardware and sofware)

# Remote Handling System







**Main involved technologies**

- Special cranes
- Telemanipulators
- RH tools
- Radiation monitoring

# DONES overall framework



**The need for a facility of this type was identified long time ago and work has been carried out by using different frameworks**

**In the last 15 years, key projects are: IFMIF/EVEDA (included in the BA), WPENS –including specific Industry contract- (EUROfusion WP), DONES-PreP (EURATOM CSA), DONES-PRIME and DONES-UGR (Spanish funded projects), ….**

IFMIF

DONES Preparatory Phase

IFMIF DONES

**DONES-PRIME**
**DONES-UGR**

# IFMIF-EVEDA Validation Activities





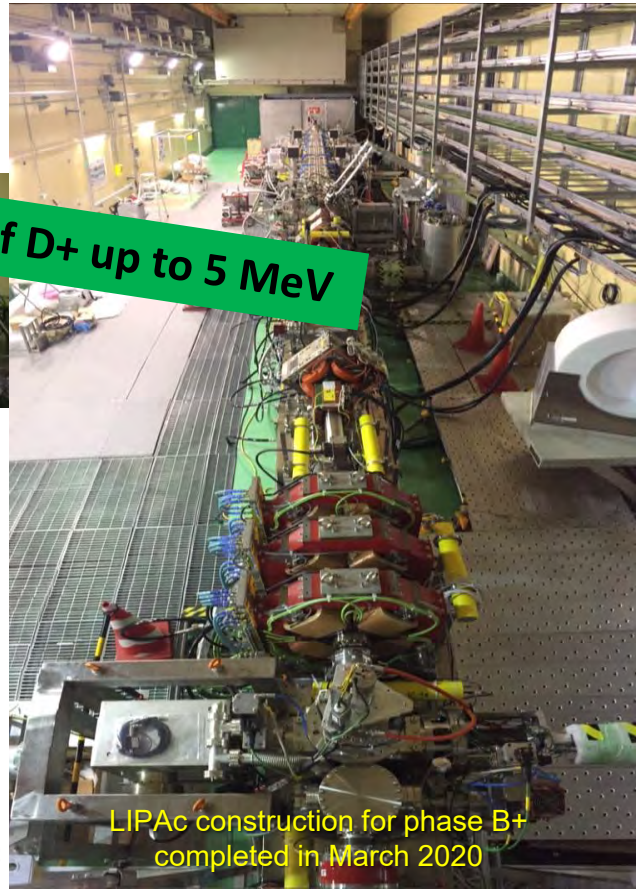
FUSION FOR ENERGY

QST

**World record achieved in 2019!!!: 125 mA of D+ up to 5 MeV**





# IFMIF/EVEDA near future



**Broader Approach-Phase II Agreement extended (at least up to 2025)**

- IFMIF/EVEDA main objective: LIPAc accelerator operation
- In the next two years it is expected that the Accelerator technology will be fully validated (operation up to full energy, full current)
- To become a test bench to optimize the DONES operation
- Training facility


**Main conclusion up to now: design seems feasible**

# WPENS Timeline

**Main objective:** To be ready, from the technical point of view, to start the DONES construction phase by the early 20´s

IFMIF-EVEDA validation activities: Orai loop, Heloka, Lifus6, LIPAc

IFMIF-DONES validation activities

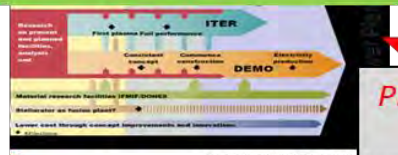
Critical technical issues analysis (quench tank location, TA approach, AC configuration,…

*IFMIF EDR 2013*

Project timeline

***IFMIF-DONES Conceptual Design Report 2014***

*PEDR (generic) 2017*




*PEDR (Granada) mid 2019*

*PSAR-v2 mid 2020*

*PEDR (Granada) end 2020*

*Reference Design 2016*

***EU site agreed: Granada End 2017***

*PSAR-v1 mid 2019*

*Plant and systems requirements definition*
*Design guidelines*
*Boundaries and interfaces identification*
*Implementation of design choices*
*Systems design*
*Integrated analysis*

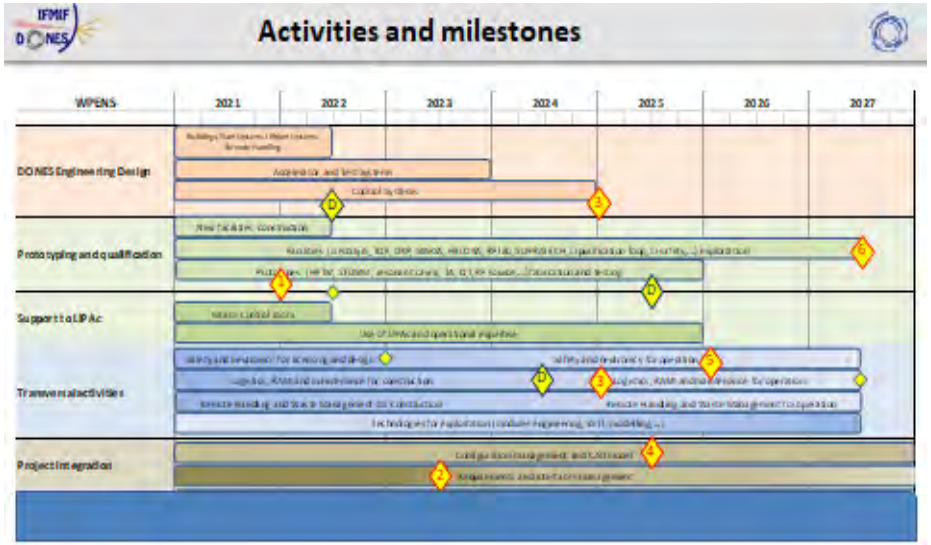
**we are close to the objective!!!**

# WPENS near future



To continue with the IFMIF-DONES design activities:

- Draft specifications for the main building and conventional plant systems contracts ready in 1-2 years
- To develop some key-component prototypes
- To support the (future) Project Team with long-term transversal activities (safety, availability, maintenance, neutronics,…)
- To prepare the operation phase



# DONES-Preparatory Phase



*(…) IFMIF-DONES will play a strategic role in the Energy domain for the implementations of Nuclear fusion solutions to the massive production of energy.*



## DONES Preparatory Phase

- COM CSA, linked to ESFRI
- Budget: 4 M€, October 1st 2019- December 30th 2021
- **Partners:** Institutions from Spain, Belgium, Croatia, France, Germany, Hungary, Italy, Poland, Portugal, UK; **Observers:** F4E, EUROfusion, Institutions from Japan and Switzerland, EU Scientific Associations, Spanish Government institutions,…

Main objective:

**To prepare a draft agreement on the international implementation of the DONES Facility project**

**One objective of the DONES Prep-Phase is to define the possible contributions from different partners**

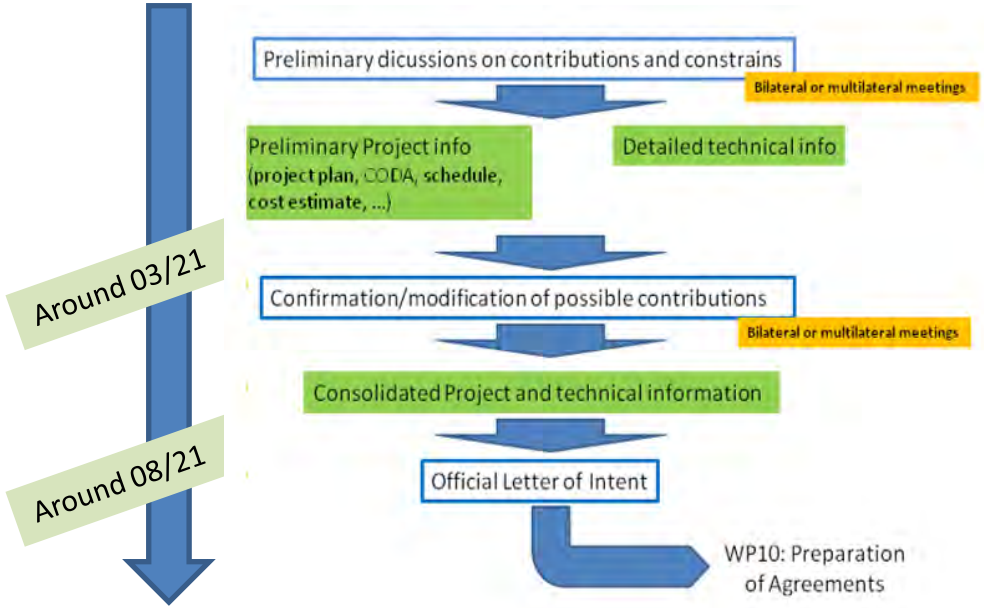
Contributions based on in-kind approach

In order to obtain its contribution, is important to provide a set of documents, so, the partners get a general view of the Project.

These documents are in the scope of DONES Prep-Phase

WP 5.0 Financial Approach

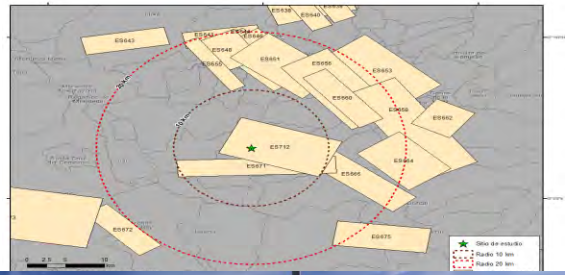
- 5.1 Cost estimates and cost book
- 5.2 Development of a financial planning
- 5.3 Preliminary financial contributions by the partners



# DONES-PRIME and DONES-UGR



- **Main objectives**: to support the proposal to built the facility as soon as possible and to assure a fast start of the project
- Technical objectives:
  - Full detailed characterization of the site (geotechnical, seismic, radiological, meteorological,…)
  - Construction of some buildings
  - Initial steps for a Project Office (around 10-12 people in 20-21)
  - Specific training program (around 20-30 people)
  - Construction of some specific prototypes and medium size facilities

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