# CONTENTS

### EXECUTIVE SUMMARY

# FUSION PLASMA PHYSICS

•	Interpretation and control of helical perturbations in tokamaks	1
•	Statistical physics for anomalous transport in plasmas	8
•	The anomalous transport in turbulent plasmas	16
•	Simulation of the VUV spectra from the reversed field pinch EXTRAP T2R	31
•	Participation in the exploitation of the JET Facilities	
	<ul> <li>Current and Pressure Profiles Reconstruction on JET by using magnetic</li> </ul>	
	data and data resulting from the Motional Stark Effect (MSE)	
	measurements as constraints	34
	<ul> <li>Investigation of Zeff discrepancy. Complex atom modelling for fusion</li> </ul>	
	spectroscopic diagnostics, exploitation of complex spectra for diagnostic	
	purposes	37

### **UNDERLYING TECHNOLOGY**

#### **Physics Integration**

Irradiation effects in ceramics for heating and current drive, and diagnostics systems
43
The comparative study of gamma-ray, electron beam and neutron flux radiation effect on semiconductor lasers. The evaluation of the optical absorption induced by gamma-ray and neutron radiation in solarization resistant optical fibres in the UV-visible range.

## Magnet structure and integration

• Development of chemical deposition methods for the fabrication of YBCO high temperature superconducting coated conductors for high-field applications

• Y<sub>1-x</sub>Ca<sub>x</sub>Ba<sub>2</sub>Cu<sub>3</sub>O<sub>y</sub> Targets for PLD thin films deposition and chemically CeO<sub>2</sub> buffered biaxially textured Ni-W substrates for the development of high temperature superconducting coated conductors

#### **Tritium inventory control**

• Studies on tritium permeation into various materials as a function of gas composition, partial pressure and temperature

## TECHNOLOGY TASKS

### **Tritium Breeding and Materials**

#### **Materials Development**

- NUCLEAR DATA: EFF/EAF data file upgrade, processing and benchmark analyses
  - Evaluation of cross sections for Ta for the EAF and the EFF files

57

64

<ul> <li>ADVANCED MATERIALS: SiC SiC Ceramic Composites</li> <li>Measurement of electrical resistivity unirradiated composites along different directions, up to 1000<sup>0</sup>C</li> </ul>	83
IFMIF, Test Facilities	
<ul> <li>HFTM: Implementation of suitable NDT inspection methods for the structural integrity assessment of instrumented capsules and rigs by micro-tomography. Experimental validation of real time micro-radiography of miniaturized samples under mechanical stress</li> <li>Evaluation and validation of D-Li cross-section data: Up-dated evaluations of d + <sup>6,7</sup>Li data up to 50 MeV</li> </ul>	87 101
Physics Integration	
Diagnostics	
<ul> <li>Irradiation effects in ceramics for heating and current drive, and diagnostics systems</li> <li>In-situ measurement in the visible-UV range of the response of large-diameter core optical fibres to gamma irradiation</li> </ul>	112
EFDA JET Technology	
Fusion Technology	
• Endurance test catalyst - packing mixture, proposed for water detritiation system at JET using SCK-CEN mixture	Γ,
<ul> <li>Catalyst- packing mixture preparation and delivering (after 3, 6, 9 months of exposure to tritiated and water-vapour). Characterization of the water from the LPCE column during the endurance test. Development of a regeneration procedure for catalyst/ packing mixture. Contribution to the definition of selection criteria of the catalyst/ packing and how to get these</li> </ul>	
data	123
Publications in scientific journals	
Contributions to conferences and workshops	
List of mobilities to the Euratom Associations	
Contact information	