Jules Horowitz
Reactor collaboration and MeLoDIE follow-up
SAFIR2018 JHR project
Ville Tulkki
JHR collaboration and MeLoDIE Follow-up

- Participation in the Jules Horowitz Reactor Working Groups (WG)
  - Fuel, Materials, Technology WGs
- During 2015-2016, follow-up of the tests of MeLoDIE device in Osiris Reactor
NUCLEAR AUXILIARIES BUILDING

REACTOR BUILDING

Cooling circuits

Reactor pool

Experimental area

Hot cells

Access to storage pools & hot cells

Aseismic Bearing pads

Monolithic water block

Nuclear island characteristics

51.12m x 46.75m + Φ36.6m
H 34.4m + H44.9 m
Up to 20 simultaneous experiments
Finnish in-kind

- MeLoDIE biaxial in-reactor creep device
  - Designed, manufactured and tested
  - Follow-up of tests in this project in early years

- Gamma/X-ray benches
  - Underwater system with specimen holders
  - Hot cell systems
- Design and realisation of an in-core mechanical loading device for material studies (mechanical testing of specimens under neutron flux)
- Installed in Osiris reactor at CEA Saclay in May 2015

Pressure adjusting loops
- closed helium loop
- pressure adjusting loops (4 independent loops)
OSIRIS cycle F281
1.2e14 fast flux > 1 MeV
Acq. date 11-16 July 2015
Zy-4sr specimen, 90 mm long
Axial stress level +60 MPa

Zy-4 SR with oxide layer 0.9 μm
345 ± 5 °C
Core test position 24NE
ϕ = 1.2 \times 10^{14} \text{n/cm}^2\text{s (E > 1 MeV)}

LP-filtered LVDT measurement (mm)

Reactor-induced (power density...) fluctuations

Creep rate 4.1 μm/day
noise < 1 μm rms

Axial creep measurement
Creep rate @ 60 Mpa ≈ 4 μm/day
Creep rate @ 110 Mpa ≈ 8 μm/day

Raw LVDT measurement (mm)

02/05/2017
SAFIR 2018 Interim Seminar, Espoo, 23-24 March 2017
Non Destructive Examination Benches in JHR: Finnish Contribution

Objectives

Initial checks of the experimental loading
Adjustment of the experimental protocol
Final NDE tests after the irradiation phase

Test device examination

X-ray & γ stands in reactor pool
(short lived γ emitters; examinations during intercycles)

X-ray & γ stands in storage pool

Gamma and XR scanning system in Hot cells
Sample examination

Neutron imaging stand in reactor pool
Underwater GXR benches and collimators (ready in 2020)
Working group activities

- Surveying future R&D needs
- Planning initial collaborative action of JHR community
- Jules Horowitz Operation plan 2040 (JHOP 2040) - proposal to be submitted to the Euratom H2020 call in 2019-2020
  - Roadmap for the EC how to use the Euratom access rights
- Pre-JHR era up to the starts of operation of JHR split into two
  - Preliminary ideas for the P2M OECD/NEA project
  - Preparation of structural materials project