THE MEGAPIE PROJECT – AN UPDATE

F. Gröschel,[1] **A. Cadiou,**[2] **G. Benamati,**[3] **Th. Kirchner,**[2] **J.C. Klein,**[4] **J. Knebel,**[5] **G. Laffont,**[4] **L. Ni,**[1] **B. Smith,**[1] and **A. Zucchini**[3]

1. Paul Scherrer Institut
2. CNRS-Subatech
3. ENEA
4. CEA
5. Forschungszentrum Karlsruhe

Abstract

Based on an initiative of PSI, CEA and FZK, the MEGAPIE project was started in 2000 to design, build and operate a liquid metal spallation neutron target as a key experiment on the road to an experimental Accelerator-driven System.* The project has now achieved the end of its design phase. It has experienced important changes since its start also from technical point of view and some serious technical challenges have surfaced. The target configuration and the operating conditions have been defined. The expected performance has been assessed.

The target is designed for a beam power of 1 MW and 6 000 mAh of accumulated current, consists of several subunits, which can be produced and tested separately before final assembly. It will contain about 90 l of liquid lead bismuth eutectic (LBE) serving as target material and primary heat removal fluid. The 650 kW of thermal heat will be removed by forced convection using an in-line electromagnetic pump with 4 l/sec capacity. The heat will be removed through 12 mono-wall cooling pins via an intermediate oil and a water cooling loop. The beam window made of the martensitic steel T91, experiencing a peak current density of about 50μA/cm^2, will be cooled by a jet of cold LBE of about 1 m/sec extracted at the heat exchanger exit by a second EM pump from the LBE mainstream. The design has been strongly supported by corresponding thermo-hydraulic and thermo-mechanic calculations. The nuclear assessment was complemented and refined by a benchmark exercise yielding an update of the neutron flux, spallation products and radiation damage data. Qualification of the liquid metal container materials has continued with respect to LBE compatibility and radiation damage. Since the LBE temperature will only vary between 230 and 380ºC, oxygen control was not considered necessary to mitigate corrosion.

---

* Bauer G.S., Salvatores M., Heusener G. (2001), *MEGAPIE, a 1 MW Pilot Experiment for a Liquid Metal Spallation Target*, J. Nuclear Mat. 296 (2001) 17-35.

The presentation will give an overview of the target configuration and its operating conditions. It will describe the engineering design and address the safety aspects taking into account the normal operating as well as accident conditions. Finally it will provide the results of the nuclear as well as thermohydraulic/thermomechanic analyses performed.