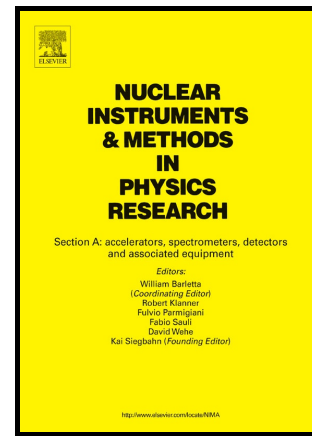


# Author's Accepted Manuscript

HERITAGE: the concept of a giant flux neutron reflectometer for the exploration of 3-d structure of free-liquid and solid interfaces in thin films

S. Mattauch, A. Ioffe, D. Lott, L. Bottyán, J. Daillant, M. Markó, A. Menelle, S. Sajti, T. Veres



[www.elsevier.com/locate/nima](http://www.elsevier.com/locate/nima)

PII: S0168-9002(16)30981-0  
DOI: <http://dx.doi.org/10.1016/j.nima.2016.09.043>  
Reference: NIMA59341

To appear in: *Nuclear Inst. and Methods in Physics Research, A*

Received date: 10 May 2016  
Revised date: 16 September 2016  
Accepted date: 19 September 2016

Cite this article as: S. Mattauch, A. Ioffe, D. Lott, L. Bottyán, J. Daillant, M. Markó, A. Menelle, S. Sajti and T. Veres, HERITAGE: the concept of a giant flux neutron reflectometer for the exploration of 3-d structure of free-liquid and solid interfaces in thin films, *Nuclear Inst. and Methods in Physics Research, A* <http://dx.doi.org/10.1016/j.nima.2016.09.043>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# HERITAGE: the concept of a giant flux neutron reflectometer for the exploration of 3-d structure of free-liquid and solid interfaces in thin films.

S. Mattauch<sup>a</sup>, A. Ioffe<sup>a</sup>, D. Lott<sup>b</sup>, L. Bottyán<sup>c</sup>, J. Daillant<sup>d</sup>, M. Markó<sup>c</sup>, A. Menelle<sup>e</sup>, S. Sajti<sup>e</sup>, T. Veres<sup>e</sup>

<sup>a</sup>JCNS at MLZ, Forschungszentrum-Jülich GmbH, 85747 Garching, Germany

<sup>b</sup>Helmholtz Zentrum Geesthacht, 21502 Geesthacht, Germany

<sup>c</sup>Wigner Research Center for Physics 1525 Budapest, Hungary

<sup>d</sup>Synchrotron Soleil L'Orme des Merisiers Saint-Aubin - BP 48 91192 Gif-sur-Yvette, France

<sup>e</sup>Laboratoire Léon Brillouin CEA/CNRS, CEA Saclay, 91191 Gif sur Yvette, France

Tel.: +498928910709. s.mattauch@fz-juelich@de

## Abstract

The instrumental concept of HERITAGE - a reflectometer with a horizontal sample geometry – well fitted to the long pulse structure of a neutron source is presented. It constitutes a new class of reflectometers achieving the unprecedentedly high flux for classical specular reflectometry combined with off-specular reflectometry and grazing incidence small-angle scattering (GISANS), thus resulting in a complete 3-d exploration of lateral and in depth structures in thin films. This is achieved by specially designed neutron guides. In the horizontal direction (perpendicular to the scattering plane) the guide's elliptic shape focusses the neutrons onto the sample. In the vertical direction a multichannel geometry provides a smooth divergence distribution at the sample position while accepting the entire beam from a compact high-brilliance flat moderator.

The modular collimation setup of HERITAGE provides extremely high flexibility in respect to sample geometries and environments, including the possibility to study virtually all types of solid and liquid interfaces, statically or kinetically. The use of multiple beam illumination allows for reflectivity and GISANS measurements at liquid interfaces both from above and below without a need to move the sample.

This concept assures the delivery of the maximum possible and usable flux to the sample in both reflectivity and GISANS measurement regimes. The presented design outperforms the flux of all present-day and already for the ESS planned reflectometers and GISANS setups in flux and in measuring time for standard samples.

**Keywords:** Neutron instrumentation; reflectometry; focusing GISANS; polarized neutrons; free standing liquid interfaces; kinetics

## 1. Introduction

The decision on the construction of the European Spallation Source (ESS) initiated a number of studies on the instrumentation for a long pulse neutron source. It will provide an exciting opportunity

Download English Version:

<https://daneshyari.com/en/article/5493007>

Download Persian Version:

<https://daneshyari.com/article/5493007>

[Daneshyari.com](https://daneshyari.com)