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Editorial

^{3}He replacement in neutron detection: Current status and perspectives*

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One of the most important issues that the neutron community is currently facing is related to the lack of ^{3}He for detection purposes. This problem has triggered an interesting and stimulating research and development activity worldwide, with the aim of finding effective and cheap solutions for ^{3}He replacement. With the advent of new materials, advanced electronics and more powerful real-time computing tools, it has now become possible to investigate novel designs of neutron detectors to be used in various fields of research and technology, and to address the needs of more sophisticated applications.

For the broad community of researchers involved in neutron instrumentation and applications, this context represents a fertile ground to start a joint activity, sharing information and putting together their respective experience and competence.

The proposal of a *Focus Point* of the European Physical Journal Plus was conceived after a workshop on "HElium REplacement in Italy" ("HERE in Italy"), held at the ENEA Frascati Research Centre on 2-3 December 2013, in which some ideas on novel ^{3}He-free detectors were discussed. The aim of this issue is to present an up-to-date, although not exhaustive, review on the R&D activities on ^{3}He-free neutron detectors, with the aim of generating further discussions and activities on the subject. It is fundamental, in this respect, to stimulate synergies between groups with different expertise, from the development of new solid-state, gaseous or scintillator detectors, to the optimization of techniques for the deposition and characterization of neutron-converting material, in particular ^{10}B or ^{6}Li-based films, to the R&D of high-performance front-end and readout electronics. Finally, it is of crucial importance the availability of neutron sources where the new detectors and technique can be tested and validated. The neutron detectors should cover an energy range of several orders of magnitude, from the ultra-cold to the GeV region. Typical applications range from the thermal neutron scattering techniques for condensed mater studies to techniques relevant for nuclear physics, including fusion research and studies involving very high-energy neutrons. Finally, applications for homeland security are becoming increasingly important and deserve a particular effort.

The articles presented in this *Focus Point* cover the various aspects related to the development of innovative ^{3}He-free neutron detectors, indicating possible solutions and pointing out to the open issues that still need to be addressed and solved. We hope they can serve as a basis for further work and progresses in this very important subject.

N. Colonna, A. Pietropaolo, and F. Sacchetti

Guest Editors

* Contribution to the Focus Point on "^{3}He replacement in neutron detection: Current status and perspectives" edited by N. Colonna, A. Pietropaolo, F. Sacchetti.