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Letter to the Editor

Sir,

The metrology of high-energy neutron fields is important because of the increase in the number of high-energy accelerators in research and medicine in Europe, where high-energy neutrons are the dominant component of the radiation field present outside the shielding; high-energy neutrons can also be a secondary component of the fields in the beam delivery system and in the patient's body in hadrontherapy and the occupational exposure to cosmic radiation where high-energy neutrons are a significant component of the total cosmic radiation field in aircraft and in spacecraft. The energy range of neutrons in these fields extends from thermal energies to several gigaelectron volts.

In order to make measurements of high-energy neutron fields or for benchmark measurements of calculated fields, it is necessary to characterise and to calibrate instruments in reference fields at energies from 20 MeV up to an energy approaching 1 GeV. Although there are ISO reference fields of <20 MeV, there are none at higher energies. High-energy quasi-monoenergetic neutron (QMN) fields allow for the detailed determination of the energy- and direction-dependent responses of active and passive neutron devices and also the neutron responses of those instruments designed to measure other types of radiation.

QMN fields with energies up to several hundred megaelectron volts have been made available in recent years, with access for dosimetric measurements of devices. In many cases, these facilities are linked to medical facilities. The resulting neutron energy distributions of QMN fields consist of two components, a peak close to the energy of the incoming proton and a broad and roughly even distribution down to thermal energies. Each of these components contains about half the neutron fluence rate. Efforts have been made to fully characterise the fields, but none are reference facilities with traceability to National Metrology Institute.

It is the authors' understanding that there are five QMN facilities worldwide, which could provide neutrons of energy of >40 MeV for the above-mentioned purposes, one in South Africa, three in Japan, one in Europe, with none in the USA or Canada. The only such QMN facility in Europe is TSL in Uppsala, Sweden, and this is threatened with shutdown in the immediate future. It is likely that by 2016, QMN beams with energies of >40 MeV will be available only in South Africa and Japan. The author considers that it is important to actively consider the provision of a European QMN reference facility for commercial activities in the development and calibration of neutron detection instruments, and for the investigation of radiation hardening of devices, and for general research needs. An alternative option, although less satisfactory, would be to provide funding to the South African facility to establish it as a reference facility with access for European users.

EURADOS has recently published as Report on this topic: EURADOS Report 2013-02 *High-energy quasi-monoenergetic neutron fields: existing facilities and future needs* (Braunschweig: 2013). The authors represent the EURADOS Council.

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