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Characterization of the neutron field at the ALBA synchrotron

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Abstract

Synchrotron light is produced at ALBA from electrons at 3 GeV in a storage ring of about 270 m circumference. Electrons are initially accelerated by a LINAC up to 110 MeV, then transferred to the booster where they are accelerated to 3 GeV, and are finally transferred to the storage ring where they produce the synchrotron radiation used at the experimental stations. Transfer lines between LINAC and booster and between booster and storage ring are the most likely places where electrons may interact with beam elements. Although cross sections for neutron production from electrons are small, a considerable number of neutrons may result from these interactions given the relatively high beam intensity.

Neutron production was simulated at these places using FLUKA. Neutron fluence measurements were performed with the UAB Extended Range Bonner Sphere Spectrometer (BSS), able to detect neutrons from the thermal energy region up to at least 1 GeV. The response matrix of the spectrometer was extended to 3 GeV Measurements took place in a point at 149 cm from the scraper, inside the shielding tunnel, and in a point close to this position but outside the tunnel, in the experimental hall.

Spectrometric results from simulation and measurements will be presented, as well as fluence and ambient dose equivalent values. A discussion will be presented about the particularities and difficulties related to this type of measurements and simulation.

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