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#9-280 Experimental proof-of-concept and first field tests of the dual gamma-neutron imager GN-Vision

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Compton imaging represents a promising technique for Prompt Gamma (PG) imaging for range verification in hadron therapy (HT) treatments. As for neutron monitoring, a drawback of most of the available systems is that only integral off-field neutron-fluence values are registered but no information is obtained from its spatial origin. Dual neutron and gamma imaging is also of prime interest for nuclear safety and security applications. In this context, we have designed and patented a innovative dual neutron and γ-ray imaging tool, so-called GN-Vision, that aims at addressing the most relevant challenges for the aforementioned applications. The system consists of a compact and handheld-portable device capable of measuring and simultaneously imaging γ-rays and slow –thermal to 100 eV –neutrons.

The GN-Vision device follows the design of the previous i-TED detector, an array of Compton cameras based on large monolithic position sensitive $LaCl_3$(Ce) crystals that were initially designed for neutron-capture experiments at CERN. Moreover, the applicability of i-TED to range verification in ion beam therapy and imaging-based dosimetry in BNCT has been explored with promising results. In addition to i-TED, GN-Vision exploits a neutron-gamma discriminating detector together with a passive collimator to achieve neutron imaging, while keeping the Compton imaging of γ-rays.

Following the conceptual demonstration of the simultaneous neutron and gamma-ray imaging in a first Monte Carlo study, we have been working at IFIC in the technical implementation of the earliest prototype. In this contribution we will first review the development and characterization of a position-sensitive CLYC detector that acts as the neutron imaging layer and γ-ray Compton scatterer of GN-Vision. The successful development of the position-sensitive neutron-gamma discrimination capability has laid the foundations for the first proof-of-concept experiment of the neutron imaging capability, that will be reviewed in this talk.

By the time of the conference, we expect to have carried out important advances towards the experimental integration of the neutron and gamma imaging capabilities and the full experimental validation of GN-Vision. Together with these recent progresses, we will also show preliminary results of the first field test of GN-Vision for nuclear safety and medical applications.

As an outlook, the contribution will present simulation studies that aim at evaluating and optimizing the performance of the utter GN-Vision device, and will outline the plans for upcoming pilot experiments for its validation in relevant scenarios.

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