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# Simultaneous Gamma-Neutron Vision (GN-Vision): Proof-of-concept of the neutron imaging capability and prospects of the final device

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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 [1], an array of Compton cameras based on large monolithic position sensitive LaCl3(Ce) crystals that were initially designed for neutron-capture experiments at CERN [2]. Moreover, the applicability of i-TED to range verification in ion beam therapy [3, 4] and imaging-based dosimetry in BNCT [5, 6] 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 [7].

Following the conceptual demonstration of the simultaneous neutron and gamma-ray imaging in a first Monte Carlo study [7], we have been working at IFIC in the technical implementation of the first prototype. In this contribution we will present the development and characterization of a position-sensitive CLYC detector that acts as the neutron imaging layer and γ-ray Compton scatterer of the dual γ-ray and neutron imaging system GN-Vision. The succesful implementation of the position-senstivite neutron-gamma discrimination capability has layed the foundations for the first proof-of-concept experiment of the neutron imaging capability [8], that will be presented in this talk. Last, the contribution will cover the future prospects, including the studies on the optimization of the collimation system, the advances towards the neutron and gamma imaging integration, the expected performance of the complete GN-Vision device and the plans for upcoming field test-measurements.
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## Abstract

**Primary author(s) :** LERENDEGUI MARCO, Jorge (Instituto de Física Corpuscular); CISTERNA, Gastón (Instituto de Física Corpuscular); HALLAM, James (Instituto de Física Corpuscular); SANCHIS-MOLTÓ, Andrea (Instituto de Física Corpuscular); BABIANO, Víctor; BALIBREA CORREA, Javier (Instituto de física corpuscular IFIC); CALVO, David (IFIC); DOMINGO-PARDO, César (Instituto de Física Corpuscular (IFIC)); DE LA FUENTE ROSALES, Gabriel (Instituto de Física Corpuscular (IFIC)); BERNARDINO GAMEIRO, Bernardo (Instituto de Física Corpuscular (IFIC)); LADARESCU PALIVAN, Ion; TORRES-SÁNCHEZ, Pablo

**Presenter(s) :** LERENDEGUI MARCO, Jorge (Instituto de Física Corpuscular)

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