

## First results from the HENSA/ANAIS collaboration at the Canfranc Underground Laboratory

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Neutrons are one of the main sources of experimental background in underground laboratories. A good knowledge of their spectral distribution is required in order to assess the effect on low counting rate experiments in astrophysics, dark matter and neutrino research. The High Efficiency Neutron-Spectrometry Array (HENSA) has been developed in order to achieve the characterization of the neutron background at the Canfranc Underground Laboratory (LSC).

HENSA is a detection system based on the Bonner Spheres principle [THO02]. In order to be sensitive at different energy ranges (from thermal energies to 10 GeV), it is composed by several independent long  $^3\text{He}$ -filled proportional counters embedded in High Density PolyEthylene (HDPE) moderators with different sizes. The neutron flux spectrum is obtained from the experimental counting rates by means of iterative reconstruction algorithms. Key to the reliability of the reconstruction process is the use of an initial guess spectrum close to the true spectrum. Early versions of HENSA have already been used for characterization of the neutron background at LSC, before the start of the scientific experiments [JOR13], and in the shallow underground facility Felsenkeller in Dresden [GRI20].

The HENSA/ANAIS collaboration aims for a precise determination of the neutron background, including its possible seasonal fluctuation, affecting ANAIS-112, an experiment looking for dark matter annual modulation with NaI(Tl) scintillators [AMA21]. For the initial tests some modules of the HENSA setup were installed in Hall B at LSC, in a position close to ANAIS-112 setup. The measurements started in March 2021 and a long term characterization of the neutron background in this position is foreseen until December 2022.

In this work, FLUKA Monte Carlo calculations of the neutron background spectrum at the LSC facility will be reported. The simulations are based on previous measurements of the rock composition and intrinsic radioactivity [AMA06]. These calculations provides a guess input for reconstruction of the spectral distribution in HENSA measurements. In addition, the first results of HENSA/ANAIS experimental measurements in Hall B will be presented and discussed.

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### Reference to paper (DOI or arXiv)

### Your gender (free text)

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