A BGO set-up for the ^{2}H(p,γ)^{3}He cross section measurement at the BBN energy range

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Deuterium is the first nucleus produced in the Universe, whose accumulation marks the beginning of the so called Big Bang Nucleosynthesis (BBN). Presently the main obstacle to an accurate theoretical deuterium abundance evaluation is due to the poor knowledge of the ^{2}H(p,γ)^{3}He cross section at BBN energies [1].
The fusion cross section of the reaction is under studying at LUNA (Laboratory for Underground Nuclear Astrophysics) in the energy range of interest ($30 < E_{cm}[keV] < 300$). The experiment consists of two main phases characterized by two different setups. The present poster is focused on the first one based on a windowless gas target filled with deuterium together with a BGO detector. The scintillator crystal is optically divided into six sectors, each covering a 60^o azimuthal angle, granting a configuration geometry close to 4π. Thanks to its high detection efficiency (about 60% in the energy range of interest) this setup will provide measurements down to very low energies [2].
The present poster will report on the BGO phase of the experiment. The characterization of the setup, background conditions, and potential sources of uncertainty will be discussed.

References

[1] E. Di Valentino *et al.*, Phys. Lett. D **90** (2014) 023543

[2] V. Mossa, *Study of the $^2H(p,\gamma)^3He$ reaction in the Big Bang Nucleosynthesis energy range*, PhD thesis, Universitá degli Studi di Bari, 2018.