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Precision measurements in the beta decay of 6He

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Precision measurements in nuclear beta decay have proven in the past years their capability to search for new physics beyond the standard model (SM), by looking for deviations of certain sensitive observables away from their SM predictions. The study of the full beta energy spectrum offers a great medium for probing these observables and thus searching for new physics.
The long-term goal of this work is to perform the most precise measurement of the beta-energy spectrum in 6He decay in order to extract the Fierz interference term b, which depends linearly on the tensor coupling constants, allowing us to search for or to constrain the presence of exotic tensor interactions in the nuclear beta decay. For this purpose, we are performing two experiments at the Grand Accélérateur National d' Ions Lourds (GANIL) with slow (25 keV) and fast (300 MeV) beams of 6He. The two measurements give the possibility to study carefully the systematic effects accompanying each of them.
The experiment with the low energy beam was already performed in 2021. The setup of this experiment allows not only the Fierz term extraction, but also a high precision measurement of the 6He half-life. The spectrum shape analysis is still in progress; however, the half-life analysis is completed resulting with the world's most precise value of 6He half-life.
This contribution will introduce the general context of the project, cover the low energy experiment's setup and data analysis up to the measurement of the 6He half-life and the extraction of the Fierz term later on.

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