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Search for double alpha decay

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Alpha decay is known for more than a century, however a global microscopic description has only been developed recently by Mercier al. [1]. With the framework of covariant energy density functional, using a least action principle, the half-life of medium and heavy nuclei are in agreement within one order of magnitude with experimental values [2].

Moreover, a new type of decay was predicted : the double alpha decay, where two alpha particles are emitted with a large relative angle. Their typical branching ratio (BR) ($\sim 10^{-7}$) with respect to the single alpha decay, makes it experimentally accessible, these values of BR begin those of well-known cluster decays already detected.

A dedicated experiment was held at Isolde last June. A radioactive beam of $^{220-222}$Ra has been used, to probe for possible double alpha decay of $^{220-222}$Ra and $^{216-218}$Rn. The setup consisted in 4 DSSD, which will allow to make accurate spatial (and temporal) coincidences and therefore to drastically reduce the background due to single alpha decays. Very preliminary results on this hunt will be shown.

[1] Mercier et al., PRL 127,012501 (2021)
[2] J. Zhao et al., PRC 107, 034311 (2023)

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