Electromagnetic transition from the $4^+$ to $2^+$ resonance in $^8\text{Be}$ measured via the radiative capture in $^4\text{He}^+^4\text{He}$


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An earlier measurement on the $4^+$ to $2^+$ $\gamma$-ray transition in $^8\text{Be}$ provided the first electromagnetic signature of its dumbbell-like shape[1]. However, the large uncertainty in the measured cross section precluded a stringent test of different nuclear structure models. The present contribution reports a more elaborate and precise measurement of this transition (Fig.1) via the radiative capture in the $^4\text{He}^+^4\text{He}$ reaction, improving the accuracy by about a factor of three. The ab initio calculations of the radiative transition strength with improved 3-nucleon forces give a $B(E2\downarrow; 4^+)$ of $27.2 \pm 1.5 \text{e}^2\text{fm}^4$ while the data yields a value of $21 \pm 2 \text{e}^2\text{fm}^4$. The capture cross sections have been compared with the predictions of the alpha cluster model.

Fig. 1. Schematic of the experimental setup, 2D spectrum at $E_\alpha=22.4$ MeV and radiative capture cross sections compared with the cluster model calculation [2].
