

The KAMEO proposal: Nuclear resonance effects in kaonic atoms

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The nuclear E2 resonance effect occurs when atomic de-excitation energy is closely matched by nuclear excitation energy. It produces an attenuation of some of the atomic x-ray lines from resonant versus normal isotope target. The investigation of the nuclear E2 resonance effect in kaonic ticklish atoms could provide important information about strong kaon nucleus interaction. In the past, only $K^- - {}^{98}_{42}\text{Mo}$ nuclear resonance effect was measured by G. L. Goldfrey, G- K. Lum and C. E. Wiegand at Lawrence Berkeley Laboratory, in 1975. The nuclear E2 resonance effect was observed, but 25 hours of data taking resulted not enough for a conclusive result.

The E2 nuclear resonance effect is expected to occur in four kaonic Molybdenum isotopes (${}^{94}_{42}\text{Mo}$, ${}^{96}_{42}\text{Mo}$, ${}^{98}_{42}\text{Mo}$, and ${}^{100}_{42}\text{Mo}$) with similar energy values. The KAMEO (Kaonic Atoms Measuring Nuclear Resonance Effects Observables) proposal plans to study this effect in these isotopes at the DAΦNE Φ factory during the SIDDHARTA-2 experiment. KAMEO will use four solid strip targets, each enriched with a different Molybdenum isotope, and expose them to negatively charged kaons produced by Φ meson decays. The X-ray transition measurements will be performed using a high-purity germanium detector, and an additional solid strip target of non-resonant ${}^{92}_{42}\text{Mo}$ isotope will be exposed and used as a reference for standard non-resonant transitions. This experiment would provide the first measurements of nuclear resonance effects in 4 isotopes of kaonic molybdenum, with needed precision for conclusive results, and a unique opportunity to study kaon-nucleus strong interaction in kaonic ticklish nuclei.

Summary

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