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CCT or no CT, that is the question

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A new mode of nuclear fission had been reported by the FOBOS collaboration: Collinear Cluster Tripartition (CCT). It was indirectly derived from “missing mass events” in fission studies with the 2ν and ν -E methods. The proposed CCT seems to be an astonishing new aspect of nuclear fission, theoretically difficult to reconcile with traditional fission models and experimentally surprising since the relatively high yield of such events (about 0.5% with respect to binary fission) should have shown up in previous experiments. These claims call for an independent verification with a different experimental technique. We report on direct searches for CCT events in $^{235}\text{U}(n,f)$ that should manifest in a considerable excess yield around $A=68-70$ compared to known binary fission events. The experiments were performed with the fission fragment spectrometer LOHENGRIN at the high flux reactor of Institut Laue-Langevin. This spectrometer provides excellent mass and energy resolution and allows clean measurements down to relative fission yields of $1\text{E}-10$. In addition, the kinetic energy phase space of CCT has been derived theoretically. The known yields of far asymmetric binary fission were confirmed but no indication for CCT events was found. Our upper limit of $1\text{E}-8$ per fission for CCT events with $A=68,70$ is more than five orders of magnitude below the yields claimed by the FOBOS collaboration.

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