EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

PH III-67/49
27 December 1967

PHYSICS III COMMITTEE

PROPOSAL: SEARCH FOR SPONTANEOUSLY FISSIONING ISOMERS

(Experiment to be carried out parasitically in the ISOLDE beam)

by

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During the last half-decade a number of spontaneously fissioning isomers have been discovered, mostly in heavy-ion induced reactions investigated by Flerov and his co-workers in Dubna. Their properties are still rather mysterious: the isomeric state, which undergoes spontaneous fission is ~ 3 MeV above the ground state, has a low spin and only its spontaneously fissioning decay mode (no α or γ) has been observed so far. The fission decay rate is ~ 10^{20} times faster than that of the ground state. The decay rates observed so far range between ~ min and ~ 10^{-7} sec. Further knowledge about this decay mode seems desirable, since some theories (Strutinski) predict that these nuclei have a very elongated (cigar-like?) shape. It is possible, that some long-lived isomers are produced in the interaction of heavy nuclei (Th, ^{238}U, ^{241}Am) with 600 MeV protons.

A search for these isomers can easily be carried out in the ISOLDE beam. (The next question, on how to investigate those isomers in more detail, will only be contemplated if their existence has been proved, since one must know their production cross-section and half-life beforehand.)

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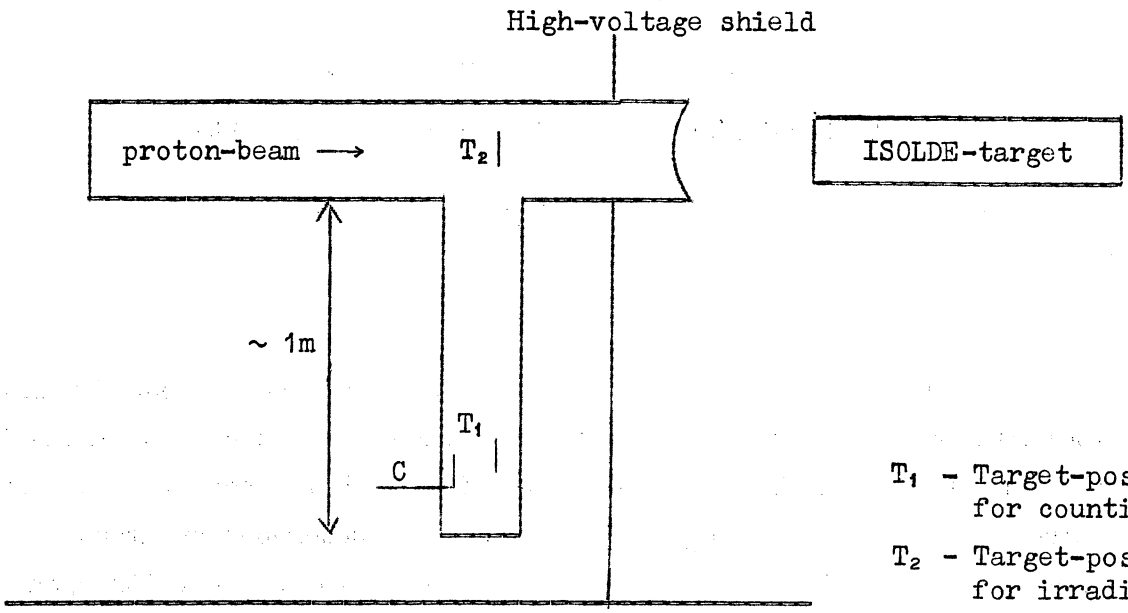
Technical requirements

No basic changes in the proton beam line are necessary and only one new foil (~ 1 mg U + 10 mg Al) × cm^{-2} will be added inside the vacuum system. This new foil will be periodically irradiated (i.e. 10 min) and then retracted to a counting position and then irradiated again. The counting of the fission events will be done with mica detectors and/or semiconductor detectors. Either slow or fast proton extraction can be used.

The following schematic drawing illustrates the set-up.



It would be appreciated if these experiments could be carried out parasitically during ISOLDE runs in the period April to December 1968. The financial costs of the experiment will be paid by the Institut für Kernchemie, Marburg.

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Note: The "ISOLDE-Committee" discussed this proposal at its meeting on 4th December 1967 and came to the following conclusion:

"As long as the passage to the ISOLDE target area is left free the Committee could not see objection to this experiment. Note: the electronic space requirements (1 rack) could be accommodated in the counting room above the experimental hall if no other parasitic experiments are present."
(Extract from the Minutes of the above-mentioned meeting.)