

## 5 Weak-Interaction Studies

### 5.1 Double-Beta Decay

#### 5.1.1 Search for $\gamma$ Rays Following the $\beta\beta$ Decay of $^{100}\text{Mo}$ to the First Excited $0^+$ State of $^{100}\text{Ru}$

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Two groups have attempted the observation of the  $\beta\beta$  decay of  $^{100}\text{Mo}$  to the first excited  $0^+$  state of  $^{100}\text{Ru}$  by looking for single  $\gamma$  rays characteristic of the deexcitation of this level. This is a very favorable double  $\beta$ -decay transition with a  $Q$  value of 2 MeV. Assuming similar matrix elements as the ones governing the transition to the ground state, one expects a partial half-time of  $10^{21}$  years. At present the two groups report conflicting results:  $(6.1_{-1.1}^{+1.8}) \times 10^{20}$  years [Bar95] and a null result at the level of  $1.2 \times 10^{21}$  years [Blu92]. These experiments have focused on a very low background, special materials and underground laboratory. Our approach is different: we search for the detection *in coincidence* of the 2  $\gamma$  rays following the  $\beta\beta$  decay of  $^{100}\text{Mo}$  to the first excited  $0^+$  state of  $^{100}\text{Ru}$ . EG&G has manufactured two large volume germanium detectors in a geometry which optimized the counting rate of this experiment. A well shielded room, located in the basement of a three story building has been equipped with utilities and air conditioning in order to host the experiment. We expect the experiment to be “up and running” before the Summer of 98.

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[Bar95] A. S. Barabash *et al.*, Phys. Lett. B, **345**, 408 (1995).

[Blu92] D. Blum *et al.*, Phys. Lett. B, **274**, 506 (1992).