

plutonium in the Materials Testing Reactor at the Arco Reactor Station. This was then put on a gold backing foil and bombarded in the 60-inch cyclotron with helium ions (40 MeV) with the expectation that this reaction might occur, based on previous experience with reactions of this kind. Now this was a kind of calculation that was made before the experiment was attempted to indicate whether it might be feasible to produce and identify such an element. This is a rough calculation:

$$N \cong N^i \sigma I t$$

$$(10^9)(10^{-27})(10^{14})(10^4) \cong$$

One atom per experiment

Slide 2

calculating the number of atoms that might be produced which would be equal to approximately the number of atoms of target material times its cross section times the ion beam intensity times the time of bombardment, which of course, would be related to the half-life of the product when bombarding for a time of the order of its half-life. And, on that basis, using for example 10^9 atoms and an estimated cross section of 10^{-27} cm² (about a millibarn), based on measurements of similar reactions in this region, and a beam of 10^{14} helium ions per second, which could only be obtained by literally rebuilding the 60-inch cyclotron because we weren't getting beams of this order of magnitude, and something of the order 10^4 seconds, we came out with the result that one would expect perhaps one atom per experiment. And it was on this basis that it was decided that it was feasible to go ahead.

Now one of the key changes or improvements in technique that was introduced here for the first time by Albert Ghiorso, was the recoil technique,