

Abstract Submitted  
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**A search for 2-photon emission from the 662 keV state in  $^{137}\text{Ba}$**   
C.J. LISTER, K. MORAN, E. MERCHAN, R. SHEARMAN, University of Massachusetts, Lowell, E.A. MCCUTCHAN, NNDC Brookhaven National Laboratory, S. ZHU, M.P. CARPENTER, J.P. GREENE, D. SEWERYNIAK, Argonne National Laboratory, D.J. MILLENER, R.J. SUTTER, Brookhaven National Laboratory — Two photon decays from excited nuclear states provide an interesting test both of QED and nuclear structure. It has been extensively studied for cases where one photon decay is forbidden [1]. Two photon decay in direct competition with the first order process has never been convincingly demonstrated. The  $^{137}\text{Ba}$  case is particularly interesting as the decay has high multipolarity, M4, so the 2-photon process can have contributions from both quadrupole-quadrupole and dipole-octupole multipolarities. New calculations and new measurements with NaI(Tl) counters from Brookhaven suggest that the two photon branch is  $\sim 2 \times 10^{-6}$ . Gammasphere is the perfect tool for this investigation, having good energy resolution, high efficiency, broad coverage of angles, and sufficient granularity to minimize pile-up and count-rate difficulties. A very large data set was collected involving more than  $10^{11}$  decays. Evidence for the 2-photon branch has been found, despite the daunting background from Compton scattering. This work was supported by DOE contracts, DE-FG02-94ER40848, DE-AC02-06CH11357, DE-AC02-98CH10886 and DE-AC02-98CH10946.

[1] J. Kramp, et. al, Nucl. Phys. A474 (1987) 412

Christopher Lister  
University of Massachusetts, Lowell

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