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A search for 2-photon emission from the 662 keV state in ¹³⁷Ba using Gammasphere C.J. LISTER, University of Massachusetts, Lowell, E.A. MCCUTCHAN, NNDC Brookhaven National Laboratory, K. MORAN, University of Massachusetts, Lowell, S. ZHU, M.P. CARPENTER, J.P. GREENE, Argonne National Laboratory, J.D. MILLENER, R.J. SUTTER, D.E. ALBURGER, 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. Nonetheless, observation of this decay will provide additional challenging tests for experiment and theory. The ¹³⁷Ba 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. Gammasphere is the perfect tool for this investigation, having good energy resolution, good efficiency, good coverage of angles, and sufficient granularity to minimize pile-up and countrate difficulties. A short test experiment showed the power of Gammasphere and the dauntingly high Compton scattering background that need suppression. However, new calculations and new measurements from Brookhaven suggest that the two photon branch is $\sim 2 \ge 10^{-6}$ and should be measurable. This work was supported by DOE contracts, DE-FG02-94ER40848, DE-AC02-06CH11357 and DE-AC02-98CH10946.

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

C.J. Lister University of Massachusetts, Lowell

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