SCINTILLATION COUNTERS APPLIED TO THE STUDY OF ENERGY LEVELS OF Be^8.

by

Alan John Fraser Boyle, B.Sc.

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PREFACE

This dissertation deals with a number of experiments that were performed in an attempt to clarify the experimental situation pertaining to the level structure of Be^8 at low excitation energies.

This nucleus offers an unambiguous interpretation on any simple nuclear model and the only levels predicted below an energy of about 10 MeV are a 0^+ ground level and a 2^+ level at about 3 MeV. However, evidence accumulated from a number of experiments, suggesting a more complicated level structure. Since these results could not be explained by any modification of the existing theories it was considered essential to verify and extend these earlier results.

The work described in Chapter 1. was carried out at the University of Melbourne during 1952 in collaboration with Dr. J.G. Campbell. The experiment began as an attempt to examine the spectrum of gamma-radiation from the $Li^7(p,\gamma)$ reaction for evidence of transitions to reported levels in Be^8 other than the ground and first excited states. However, the means of detection chosen, the scintillation counter, proved to be inadequate. Since little was known, at the time, about the characteristics

of scintillation counters when used for gamma ray detection, an investigation was undertaken to explain the poor results obtained with the high energy radiation from this reaction. No particular section of this work was contributed by either Dr. Campbell or myself.

The remainder of the work described was carried out at the Australian National University over the period 1953-5. The experiment described in Chapter 4, Part A, was performed in collaboration with Dr. E.K. Inall. I had little to do with the initial design of this experiment, but helped in much of the experimental work. The remaining experiments described were performed independently.

I would like to express my sincere thanks to Professor E.W. Titterton C.M.G., who provided many of the initial ideas, and by his continual drive and enthusiasm has made this work possible.

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