

## GAMMA-GAMMA-GAMMA DIRECTIONAL CORRELATION MEASUREMENT TECHNIQUE

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### ABSTRACT

Gamma-Gamma-Gamma directional correlation method for radiations from radio-active nuclei has been described. The experimental technique and the four "normal geometrical configurations" for the triple directional correlation have been explained.

### INTRODUCTION

The gamma-gamma directional correlation technique is quite well known and many books and review articles have been written on this topic.<sup>1-3</sup> The directional correlation of two radiations is a very useful tool in nuclear structure research, and during the last three decades this technique has contributed enormously to our knowledge of the atomic nucleus. But the method has some limitations. If more than one multipoles are present in a gamma transition, an unambiguous determination of the multipole mixing ratios is difficult, if not impossible, if only the directional correlation of two radiations is observed. In such cases, additional information about the mixed multipole character of the transition may be obtained by observing the triple directional correlation of three radiations,  $\gamma_1$ ,  $\gamma_2$  and  $\gamma_3$ , emitted in a

triple cascade  $I_0 \xrightarrow{\gamma_1 (L_1 L'_1)} I_1 \xrightarrow{\gamma_2 (L_2 L'_2)} I_2 \xrightarrow{\gamma_3 (L_3 L'_3)} I_3$ , from an initial, random state  $I_0$  to the final state  $I_3$  through the intermediate states  $I_1$  and  $I_2$ .

The triple gamma directional study is important in many respects. It is an improvement, in three ways over the gamma-gamma directional correlation study: (1) In a complicated decay scheme, having double as well as triple cascades, the triple gamma cascade can be distinguished from the double cascades for directional correlation study. (2) The possible permutations of spin assignments to the excited nuclear levels can be minimized by triple gamma-ray cascade as compared to cascades of two gamma-rays. (3) The various possible geometries provide an additional parameter for information. Two advantages gained in the method are: (1) Com-