Angular Correlations and Distributions with AGATA, What should we do?

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γ angular distributions and correlations

Angular distributions/correlations are Clebsch-Gordan intensive!

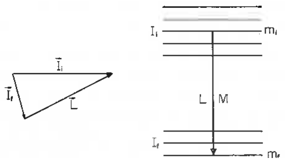
This because nuclear states have "sharp" spin and parity$\rightarrow$ everything is written as sums over tensors with fixed L,π (EM field, geometry etc). Someone who enjoys hard work with little return could always keep the plane wave representation of the EM field and expand the nuclear states in a plane wave basis... And there are a lot of rotations, which in the world of QM always end up in a sum over CG and rotations D^L_{Mm}

My idea was to. . .

Give a nice introduction to Angular Distribution/Correlations but I got lost in summing indices and 3-j Wigner symbols so I will do something else. . .

Simplest possible version of γ Angular Distribution/Correlation

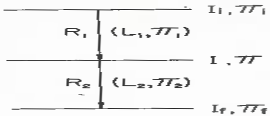
Direction of γ rays $F_L^M(\theta)$



$$\sum_{m_i m_f} P(m_i) G(m_i m_f) F_L^M(\theta)$$

In γ-ray spectroscopy different m-states unresolved

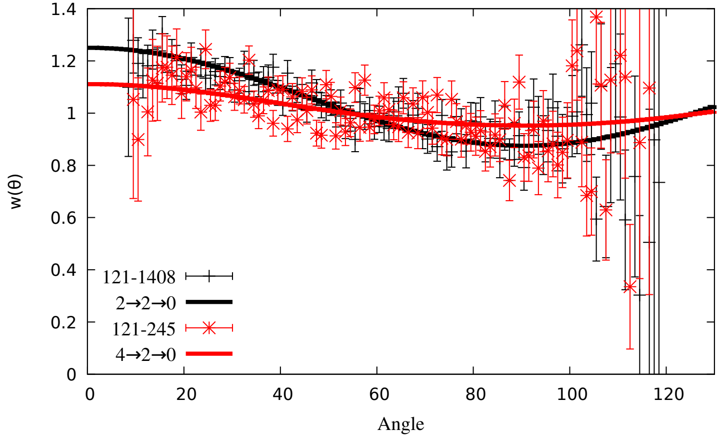
γ-ray/particle/beam fixes m population and coordinate system



π_i population distribution "known" (m_i to the left)

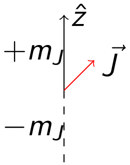
$\gamma\gamma$ angular correlations are under control

^{152}Eu source



But an initial state can be oriented

- A nuclear state has Jπ fixed, m$_J$ can vary
- Given an axis of quantazition we have...



- Different distributions of m_J have different names
- Described in the language of "statistical tensors"

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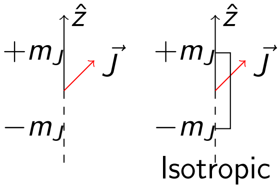

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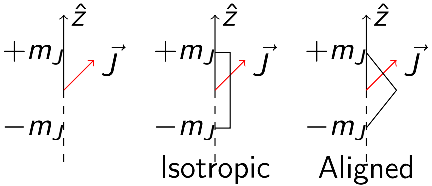

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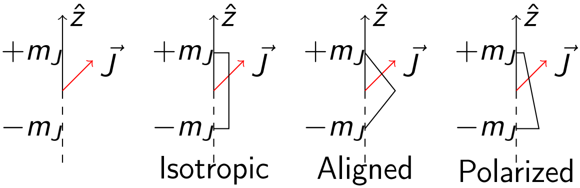

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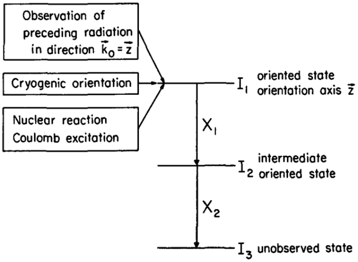
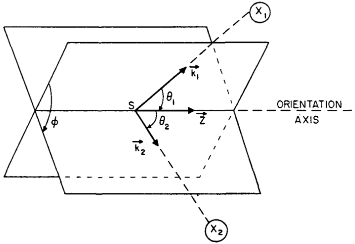
Direction Correlation from Oriented states (DCO), i.e. in-beam

Physical system of interest



Experimental situation



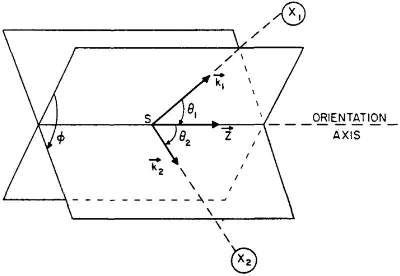
Direction correlation from Oriented states (DCO), i.e. in-beam

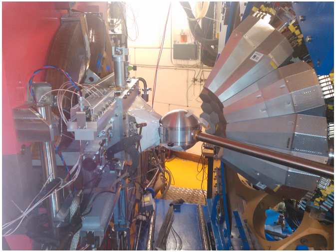
Expressed as

$$W(\theta_1,\theta_2,\Phi) = \sum_{\lambda_1\lambda\lambda_2} B_{\lambda_1}(I_1)A_{\lambda}^{\lambda_2\lambda_1}(X_1)A_{\lambda_2}(X_2) \times \frac{4\pi}{2\lambda_2+1}\sum_q \langle\lambda_1 0 \lambda q|\lambda_2 q\rangle Y_{\lambda q}(\theta_1,0)Y^*_{\lambda_2 q}(\theta_2,\Phi) \quad (10)$$

Direction correlation from Oriented states (DCO), i.e. in-beam

AGATA geometry for typical GANIL exp.





So, what should we do

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